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Exploring the Factors Which Affect Cohesion and Conflict in Distributed Information Systems Development Project Teams

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Declaration

This is to certify that the work I am submitting is my own and has not been submitted for another degree, either at the University College Cork or elsewhere. All external references and sources are clearly acknowledged and identified within the contents. I have read and understood the regulations of University College Cork concerning plagiarism.

List of Research Outputs

This dissertation is based on peer-reviewed papers published in the proceedings of prominent international and European conferences in the field of information systems. The contributions included in this dissertation are as follows:

Chapter 5 - McCarthy, S., O'Raghallaigh, P., Fitzgerald, C., Adam, F., (2017), "A Typology for Organizational ICT Practice", 50th *Hawaii International Conference on Systems Sciences (HICSS)*, 3-7 January 2017, Hawaii, US.

Chapter 6 - McCarthy, Stephen, O'Raghallaigh, P., Fitzgerald, C., Adam, F. (2019), "Towards a Framework for Shared Understanding and Shared Commitment in Agile Distributed ISD Project Teams", *27th European Conference on Systems (ECIS)*, 8-14 June 2019, Stockholm, Sweden.

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Abstract

In recent years, we have witnessed an increasing trend towards the conduct of Information Systems Development (ISD) projects in distributed environments, whereby ISD team members are geographically, spatially and organizationally dispersed. This has been driven by the desire of organizations to expand their pool of development resources and to gain access to diverse sources of expertise, irrespective of location or organizational affiliation. While these benefits are impressive, the conduct of distributed ISD projects is far from a routine undertaking. This is reflected more broadly in the high rate of ISD project failure recorded across different industry sectors and organizational settings over the past twenty years.

In particular, the effectiveness of distributed ISD teams is often inhibited by deep seated social and task-related differences between team members. For instance, distributed ISD project team members typically come from diverse backgrounds which can create social challenges around the alignment of structures, identities, and cultures, as well as task-based challenges related to the delivery of project outcomes. In light of these challenges, literature suggests that cohesion is a key determinant of team performance. However, a competing set of literature asserts that conflict is essential for exploiting diverse knowledge. These contrasting bodies of literature highlight an opportunity to explore the factors which affect the tension between both cohesion and conflict in distributed ISD projects and the impact these have on team performance.

The dissertation therefore seeks to explore how cohesion and conflict co-exist and co-evolve through distributed ISD project team interactions, and how this impacts team performance. The dissertation presents a within-case and cross-case analysis of three distributed ISD projects. Each in-depth case study is characterised by inherent aspects of complexity or 'wickedness' which created unique challenges around the need for both cohesion and conflict. For instance,

the distributed ISD projects were undertaken in emergent areas (i.e. connected health), and the team members in each case had not worked together before.

In order to explore this emerging research area, theory building is undertaken by the researcher to describe and explain the factors which affect cohesion and conflict in distributed ISD project team interactions. The theoretical framework co-evolved through empirical insights from the in-depth case studies as well as logical propositions from seminal literature. Discussions of case study findings are structured according to the concepts developed in the theoretical framework, as well as their underlying relationships. These emergent theoretical insights are also used to guide discussions around both team performance and distributed ISD project team leadership later in the dissertation.

The dissertation presents a number of unique contributions. Firstly, the dissertation develops a novel theoretical framework for describing and explaining how the interplay between different factors shape team interactions in distributed ISD projects. This contribution can help deepen scholars' understanding of the complex and dynamic nature of team interactions in distributed ISD projects. Secondly, the dissertation contributes insights into how shared understanding and shared commitment among the team can be affected by these factors. In particular, findings presented from the in-depth case studies suggest that shared understanding and shared commitment may evolve in ways which are often unexpected. Thirdly, novel contributions are made by considering the relationship between cohesion, conflict and team performance. For instance, findings from the cross-case analysis suggests that cohesion and conflict are both needed to maximise team performance in distributed ISD projects. In particular, findings suggest that cohesion and conflict are appropriate for realising different perspectives of ISD project team performance. Lastly, the dissertation contributes insights into how team leaders can respond to social and task-based factors in distributed ISD projects. The dissertation puts forward a new style of team leadership called 'agitation'. This theoretical contribution expands on existing literature by considering how team leaders embed constructive conflict into team member interactions in order to challenge social and task-related differences. Finally, the dissertation puts forward the concept of ‘leadership intelligence’ to contribute insights into how leaders can develop the sensitivity to know when to promote and suppress different leadership styles over the course of a project, and indeed even during an individual interaction.

The structure of the dissertation is as follows: Chapter 1 provides a high-level introduction to the dissertation and sets out the structure of the remaining chapters as well as how they relate to each other. Chapter 2 presents a review of existing literature across the key areas of study and identifies areas which the dissertation will aim to investigate. Chapter 3 then outlines the first stage of theoretical development undertaken by the researcher which uses logical propositions from literature to investigate the relationship between concepts. Meanwhile, Chapter 4 presents an overview of the paradigm choice, research method, research strategy, and research process. Chapters 5-8 then investigate each research question in turn based on in-depth case study findings from three distributed ISD projects. Each case study is used to support theory building through empirical insights from a within-case analysis. Chapter 9 then provides a cross-case analysis of the research questions drawing on further empirical insights from across the three in-depth case studies. Chapter 10 draws the dissertation to a close with a conclusion.

Part I: Research Overview

Chapter 1: Introduction

> *"The world is not a solid continent of facts sprinkled by a few lakes of uncertainties, but a vast ocean of uncertainties speckled by a few islands of calibrated and stabilized forms."*
> Bruno Latour (2007, pg. 245)

Information Systems (IS) have become central to how modern organizations operate and conduct their day-to-day business. For instance, IS solutions such as knowledge management systems, email, and teleconferencing have transformed the ways in which individuals interact and share knowledge during the completion of work tasks (Boughzala, De Vreede, & Limayem, 2012; Griffith, Sawyer, & Neale, 2003). The importance of IS to modern organizational practices has thus created a continuous demand for information systems development (ISD) projects to develop novel IS solutions. IS solutions are proposed to offer organizations a number of benefits such as improved decision making (Kawamoto, Houlihan, Balas, & Lobach, 2005), knowledge integration (Alavi & Leidner, 2001), operational efficiency (Banker, Kauffman, & Morey, 1990), and organizational agility (Nazir & Pinsonneault, 2012).

ISD can be defined as "the integrated social and technical practices of conceptualizing and realizing information technology-based systems, and managing the associated changes and implications to accomplish specific goals in organizational contexts" (Hassan & Mathiassen, 2018, pg. 178). ISD comprises of both product (i.e. IT artefact) and process (i.e. development methodology) elements which are situated within a dynamic organizational environment (Fitzgerald, Russo, & Stolterman, 2002; Hirschheim, Klein, & Lyytinen, 1995). In particular, the organizational environment closely shapes the product and process requirements that an ISD project must cater to, as well as the constraints that the project team must operate within i.e. budget and deadlines (Hassan & Mathiassen, 2018; Russo, Fitzgerald, & Shams, 2013; Xia & Lee, 2005). For instance, an ISD project could be driven by the organizational requirement to enhance existing operations, deliver stakeholder value to different user groups, or build competitive advantage through the development of new IS solutions (Kirsch, Sambamurthy, Ko, & Purvis, 2002).

Recent years have also witnessed an increasing trend towards the conduct of ISD projects in distributed environments, whereby ISD team members are geographically, spatially and organizationally dispersed (Ågerfalk, Fitzgerald, Holmstrom Olsson, Lings, Lundell et al., 2005; Ågerfalk, Fitzgerald, & Slaughter, 2009; Garrison, Wakefield, Xu, & Kim, 2010; Kotlarsky & Oshri, 2005; Powell, Piccoli, & Ives, 2004). This has been driven by the desire of organizations to expand their pool of development resources, modularise development work across different sites, and gain access to diverse sources of expertise irrespective of location or organizational affiliation (Ågerfalk, Fitzgerald, Holmstrom Olsson, Lings, Lundell et al., 2005; Conchúir, Ågerfalk, Olsson, & Fitzgerald, 2009; Sarker & Sahay, 2004). This in turn can allow organizations to decrease their cycle time of development, increase responsiveness to changing market conditions, and foster innovation and creativity (Conchúir, Ågerfalk, Olsson, & Fitzgerald, 2009; Conchúir, Holmstrom, Agerfalk, & Fitzgerald, 2006). These opportunities would not be feasible for traditional co-located teams where individuals are situated in the same physical location as team members are typically bounded by the same set of constraints e.g. available resources, skillsets, knowledge (Jarvenpaa, Shaw, & Staples, 2004; Powell, Piccoli, & Ives, 2004). The availability of modern IT solutions such as email, teleconferencing, and groupware allow team members to coordinate work across locations with traditional delineations between virtual and non-virtual work becoming less concrete (Hertel, Geister, & Konradt, 2005; Staples & Webster, 2008).

Yet despite these promised benefits, the conduct of distributed ISD projects is far from a routine undertaking (Kotlarsky & Oshri, 2005). This is reflected more broadly in the high rate of ISD project failure recorded across different sectors and organization sizes over the past twenty years (The Standish Group, 1995, 2015). For instance, The Standish Group (2015) assert that in 2015 over half (52%) of surveyed ISD projects encountered significant challenges, while one fifth (19%) were deemed to have failed. Meanwhile, a survey of IT professionals conducted by Innotas in 2015 found that 55% of IT projects had failed; the most commonly cited reason for failure being the difficulties faced in aligning allocated project team resources with business goals (Florentine, 2016). The impact of ISD project failure then centres on issues of team performance such as the delivery of software over budget, over schedule, and with critical quality problems (El Emam & Koru, 2008; The Standish Group, 1995, 2015). Despite the proliferation of literature on ISD project teams, the high rate of ISD project failure points to the need for further research in this area.

While prior literature had conceptualised ISD as a primarily technical endeavour, there is a growing awareness of the importance of 'social aspects of systems development' which primarily centre on the study of team interactions (Doherty & King, 2005; Fitzgerald, 1996; Sawyer, Guinan, & Cooprider, 2010). Team interactions are central to the development of clear and agreed IT solutions in distributed ISD project teams. However, team interactions in distributed ISD projects are often characterised by an inherent contention arising from differences between distributed team members' diverse interests, positions, and shared meanings (Garrison, Wakefield, Xu, & Kim, 2010; Luna-Reyes, Zhang, Gil-García, & Cresswell, 2005; Sarker & Sahay, 2003). For instance, studies suggest that the lack of shared context between distributed team members can create issues around relationship building and trust in the team (Garrison, Wakefield, Xu, & Kim, 2010; Kankanhalli, Tan, & Wei, 2006; Powell, Piccoli, & Ives, 2004; Wakefield, Leidner, & Garrison, 2008). These inherent differences can make effective communication difficult, and in turn lead to the fragmentation of individuals' understandings and intentions (Conklin, 2005; Rittel & Webber, 1973).

In light of these challenges, literature suggests that team cohesion is a key determinant of the performance of distributed project teams (Garrison, Wakefield, Xu, & Kim, 2010; Hummel, Rosenkranz, & Holten, 2016; Venkatesh & Windeler, 2012). Team cohesion is said to be crucial for mitigating differences between diverse team members and ensuring that they are aligned in their intention to achieve a set objective (Garrison, Wakefield, Xu, & Kim, 2010; Kayworth & Leidner, 2002). In addition, prior studies have found that team cohesion was associated with higher levels of team satisfaction and effective communication (Chidambaram, 1996) as it helps strengthen the interpersonal attraction between team members and improves their level of shared understanding and shared commitment to tasks (X. Yang, Tong, & Teo, 2015).

Having said that, there is a competing body of literature which asserts that task conflict is essential for team performance as it allows for team members to share diverse knowledge, challenge existing assumptions, and improve creativity (Farh, Lee, & Farh, 2010; McAvoy & Butler, 2009; X. Yang, Tong, & Teo, 2015). For instance, literature cautions against the dangers of excessive levels of cohesion where the social pressure towards consensus can limit team members' ability to evaluate alternatives and make effective decisions (Hart, 1991; Janis, 1972; McAvoy & Butler, 2009). According to Janis (1972, pg. 8), high levels of cohesion in a group can create a situation whereby "the members' strivings for unanimity override their motivation to realistically appraise alternative courses of action." As a result, team members may suppress personal doubts, follow the leader's suggestions, and silence dissenters in order to preserve consensus. In contrast, periods of conflict allow team members ask critical questions, unearth underlying group assumptions, and exchange diverse knowledge in order to breed creativity (Farh, Lee, & Farh, 2010; McAvoy & Butler, 2009).

These contrasting bodies of literature therefore suggest a need for both cohesion and conflict in distributed ISD project team interactions. Teams must balance the contradictory yet interrelated opposites of cohesion and conflict over time in order to improve team performance overall (Obolensky, 2014; Smith & Lewis, 2011; Zheng, Venters, & Cornford, 2011). The tensions between cohesion and conflict can create sizable challenges for distributed ISD teams when dealing with the emerging requirements and constraints of an ISD project. However, existing literature has yet to explore the tensions between cohesion and conflict in distributed ISD project team interactions and the factors which shape their emergence.

These tensions can be heightened in domains characterised by high levels of socio-technical change or 'wickedness' (cf. Denison, Hooijberg, & Quinn, 1995; Head, 2008; Rittel & Webber, 1973; Zhang, Waldman, Han, & Li, 2015). In particular, distributed ISD project teams often face high levels of contention given the diversity of positions, interests, and shared meanings of distributed team members and the impediments to communication and coordination of technical work across distributed settings (Garrison, Wakefield, Xu, & Kim, 2010; Powell, Piccoli, & Ives, 2004). This creates a significant tension between the need for cohesion on the one hand to align distributed ISD team members around tasks, and conflict on the other to stimulate creative responses to continuous socio-technical change (Garrison, Wakefield, Xu, & Kim, 2010; Hsu, Chu, Lin, & Lo, 2014; McAvoy & Butler, 2009; Sawyer, Guinan, & Cooprider, 2010; Xia & Lee, 2005; X. Yang, Tong, & Teo, 2015).

Returning to the quote by Latour (2007, pg. 245) at the start of the chapter, distributed ISD projects can therefore be thought of as existing in an "ocean of uncertainties" where distributed ISD team members must continuously interact and share ideas in order to deal with underlying socio-technical change. Without an awareness and understanding of the potentially complex and uncertain nature of a distributed ISD project, teams may be lured into a false sense of security by assuming that a project is straightforward or routine when in reality it is not; similarly, teams run the risk of overlooking the unique characteristics of each distributed ISD project if they simply adopt an existing approach that was effective in a previous practice.

The following subsection builds on the high level overview just presented to provide a brief description of interesting avenues of research in existing literature which the dissertation intends to investigate. A more complete review of existing literature is presented in Chapter 2.

1.1. Research Avenues

This section outlines three avenues of research investigated in the dissertation: (i) distributed ISD project team interactions, (ii) cohesion and conflict in distributed ISD project teams, and (iii) the factors which affect cohesion and conflict in distributed ISD project teams.

1.1.1. Research Avenue 1: Distributed ISD Project Team Interactions

Team interactions are central to the development of clear and agreed IT solutions in distributed ISD project teams. However, based on Hassan and Mathiassen's (2018) analysis of the citation classics in ISD literature, the topic of 'people management' have received considerably less attention than other streams of research in the ISD body of knowledge. This suggests that there is considerable scope to direct increased efforts towards the development of ISD frameworks which investigate team interactions. In particular, Kotlarsky and Oshri (2005) assert that expanding our breadth of knowledge on the social aspects of ISD management in distributed settings is essential for understanding how ISD project managers can improve team performance in increasingly volatile contexts. This goes beyond the evaluation of ISD performance alone and requires dedicated and focused attention to be directed towards the social interactions between individuals, groups, and subgroups (Lim, Sia, & Yeow, 2011; Sawyer, Guinan, & Cooprider, 2010).

In the context of this dissertation, the focus is extended beyond the interactions between software developers alone to include all individuals involved in the conduct of a distributed ISD project. A distributed ISD project team is therefore defined as a group of individuals from different professional, organizational, and geographical backgrounds who are seconded to a project in order to deliver a defined IS artefact within a constrained timeframe e.g. software developers, analysts, designers, project managers, and domain experts (Ågerfalk, Fitzgerald, Holmstrom Olsson, Lings, Lundell et al., 2005; Sawyer, Guinan, & Cooprider, 2010). Each member of the distributed ISD project team contributes towards the analysis and design of the proposed IT artefact, and in turn supports the eventual delivery of the IT artefact built by the developers. Consequently, this dissertation also chooses to adopt a broad perspective of ISD as any activity in the software development lifecycle (Hirschheim, Klein, & Lyytinen, 1995). Following Ågerfalk, Fitzgerald, Holmstrom Olsson, Lings, Lundell et al. (2005), this definition of ISD extends beyond "pure" development (i.e. coding) to include other related activities such as project planning, systems analysis (e.g. requirements gathering), and design (e.g. prototyping).

1.1.2. Research Avenue 2: Cohesion and Conflict in Distributed ISD Project Teams

Distributed ISD teams must remain aware of the need for and the tension between cohesion and conflict during team interactions, given that both elements are considered important to team performance (Garrison, Wakefield, Xu, & Kim, 2010; McAvoy & Butler, 2009; X. Yang, Tong, & Teo, 2015). Team cohesion can be defined as the extent to which team members possess a shared understanding of and a shared commitment to the project, whereas team conflict can be defined as the extent to which team members diverge in their shared understanding of and shared commitment to the project (Carte & Chidambaram, 2004; Thatcher & Patel, 2011; Van den Bossche, Gijselaers, Segers, Woltjer, & Kirschner, 2011; X. Yang, Tong, & Teo, 2015). However, existing literature on distributed ISD teams typically consider cohesion and conflict in isolation of each other, and limited attention is directed towards how they coexist and relate to each other. For instance, Garrison et al.'s (2010) study on cohesion, trust, and individual performance in diverse groups does not consider the potential impact of task and social conflict on the performance of such groups. There are opportunities to further investigate what cohesion and conflict mean in the context of distributed settings, with a particular focus on the task and social dimensions of cohesion and conflict (cf. X. Yang, Tong, & Teo, 2015). There are also opportunities to research how the interplay between contextual and localised factors affects cohesion and conflict in distributed ISD team interactions (Sarker & Sahay, 2003). Investigating these issues will in turn help researchers and distributed ISD project teams to understand how ISD project team performance is defined and managed.

1.1.3. Research Avenue 3: The Factors Which Affect Cohesion and Conflict in Distributed ISD Teams

Fairhurst, Smith, Banghart, Lewis, Putnam et al. (2016) suggest that researchers must direct increased attention towards the factors which affect organizational tensions such as cohesion and conflict. In particular, Fairhurst, Smith, Banghart, Lewis, Putnam et al. (2016) suggest that studying the interplay between macro-level and micro-level factors can help us understand how organizational tensions emerge, change, and reproduce over time during team interactions. The definition of macro-level factors and micro-level factors in this dissertation are derived from the theoretical framework, which is described in forthcoming chapters. First, macro-level factors are the contextual forces of Structure, Identity, and Culture which affect team interactions and tend to persist over time. Micro-level factors are the localised forces of Vision, Approaches, and Means which affect team interactions regardless of whether they are shared by individuals or not. Sarker and Sahay (2003) and Sarker, Munson, Sarker, and Chakraborty (2009) assert that existing literature on group development in distributed ISD teams has primarily focused either on the micro-level, or the macro-level in isolation. In order to overcome this dualist perspective, Sarker and Sahay (2003) therefore recommend the need for new theoretical frameworks which conceptualise and empirically examine the interplay between macro and micro-level issues.

1.2. Research Objective

Building on the identified avenues of research outlined in the previous subsection, the research objective of this dissertation is as follows:

To explore how cohesion and conflict co-exist and co-evolve in distributed ISD project team interactions and how they impact team performance.

This research objective aims to shed light on the increasingly complex or ‘wicked’ nature of distributed ISD projects where team members are faced with the deep-seated tension between cohesion and conflict. For instance, existing literature typically describes team cohesion as positive for distributed ISD team performance as it helps align the efforts of team members around the completion of project-level tasks (Garrison, Wakefield, Xu, & Kim, 2010). However, McAvoy and Butler (2009, pg. 380) point to the dangers of excessive cohesion where “the desire for continued team cohesion, coupled with a reluctance by team members to express views contrary to… other team members and not just the project manager, leads to dysfunctional and ineffective decision making”. Consequently, McAvoy and Butler (2009) call for future case study research to explore the tension between cohesion and conflict in ISD project teams.

This research objective of this dissertation represents an important area of study as insights into the factors which affect cohesion and conflict in distributed ISD team interactions can help guide the performance of distributed ISD projects. In particular, the research has implications for the leadership and management of distributed ISD projects, and can guide the thinking of leaders and managers when faced with the challenge of balancing cohesion and conflict during team interactions. Insights into this area can help practitioners anticipate other potential challenges that they are likely to encounter during a distributed ISD project; consequently, they can go in 'with their eyes open' to the potential risks which may emerge during the conduct of a distributed ISD practice, and seek to take proactive measures to address these risks.

In pursuing this research objective, the intention of the researcher is to develop a specific agenda on distributed ISD project team interactions, particularly in environments characterised by complexity or wickedness. The research objective was also formulated with the intent of developing a theory for description and explanation as per Gregor's (2006) taxonomy of IS theories. Gregor (2006) asserts that theories for description must first provide an outline of the phenomenon under investigation (i.e. what is), analyse the relationship between constructs, and the boundaries within which these relationships and observations are relevant. Theories for explanation should then aim to explain the 'how?', 'why?', and 'when?' behind the emergence of the phenomenon in order to aid deeper levels of understanding. However, theories of description and explanation do not seek to predict when the phenomenon might occur in the future based on set preconditions, or prescribe a method or structure for an artefact to come into being. Instead the contributions of descriptive and explanatory theories are to support an analysis of salient attributes of and relationships between phenomena, and develop novel conjectures into the phenomena (Gregor, 2006).

The next subsection proposes a series of research questions, which will be used to gain in-depth insights for addressing the overarching research objective. Each research question emerged and evolved from the unique insights into the research objective pursued during the dissertation. In addition, the wording of the research questions was iteratively refined based on emerging insights into the research objective over time and the researcher's evolved understanding.

1.3. Research Questions

Building on the research objective, the research questions are developed with an aim of developing a theory for description and explanation, as per Gregor's

(2006) taxonomy of IS theories (see Section 1.2). Cohesion and conflict are studied within the context of team interactions. This is achieved by focusing both on questions of '*what?*' and '*how?*' in relation to the phenomena of interest. The research objective outlined in the last section is therefore broken down into the following related research questions (RQ):

RQ1. What factors affect team interactions in distributed ISD projects?

RQ2. How do these factors interplay with team interactions in distributed ISD projects to affect shared understanding and shared commitment?

RQ3. What is the relationship between cohesion, conflict, and team performance in distributed ISD projects?

RQ4. What is the role of distributed ISD project team leadership in leveraging cohesion and conflict?

The first research question (RQ1) is crafted in order to gain foundational insights into the type of factors which affect interactions between individuals and objects in organizational ISD practices. The answer to RQ1 in turn provides the groundwork and the first iteration of theoretical framework which draws on seminal literature from the field of sociology and information systems. In particular, the theoretical framework looks at the interplay between macro-level factors, micro-level factors, and team interactions. In this dissertation, macro-level factors relate to the large-scale contextual patterns of Structure, Identity and Culture which affect team interactions, whereas micro-level factors concern the localised factors of Vision, Approaches, and Means which affect team interactions regardless of whether they are shared by individuals or not.

Building on RQ1, the second research question (RQ2) is crafted based on the work of Conklin (2005) and seeks to explore the factors which affect shared understanding and shared commitment. Shared understanding is defined as "the degree to which people concur on the value of properties, the interpretation of concepts, and the mental models of cause and effect with respect to an object of understanding” (Bittner & Leimeister, 2014, pg. 115) while, shared commitment requires team members to dedicate resources towards the delivery of proposals that have gained shared understanding (Briggs, Kolfschoten, & Vreede, 2005; Conklin, 2005; X. Yang, Tong, & Teo, 2015). According to Conklin (2005), shared understanding and shared commitment are interdependent and emerge through ongoing interactions between members of a project team. In particular, RQ2 explores how the interplay between macro-level, micro-level factors, and team interactions affect shared understanding and shared commitment.

The third research question (RQ3) is formulated based on insights from existing literature which points to the need for both cohesion and conflict to ensure distributed ISD project team performance. Team cohesion is defined as the extent to which team members possess a shared understanding of and a shared commitment to the project (Thatcher & Patel, 2011; X. Yang, Tong, & Teo, 2015), while team conflict is defined as the extent to which team members diverge in their shared understanding of and shared commitment to the project (Carte & Chidambaram, 2004; Osborn & Paul, 2018; Van den Bossche, Gijselaers, Segers, Woltjer, & Kirschner, 2011). In particular, insights from Fairhurst, Smith, Banghart, Lewis, Putnam et al. (2016) are drawn on to explore how the organizational tensions between cohesion and conflict emerges, changes, and reproduces through team interactions over time. For instance, Fairhurst et al. (2016) assert that organizational tensions such as cohesion and conflict can only be understood by studying the continuous interplay between macro- and micro-level factors. Furthermore, the relationship between cohesion, conflict, and team performance in distributed ISD project teams is examined.

The fourth research question (RQ4) is formulated based on insights from existing literature on the role of team leadership in leveraging cohesion and conflict. Wakefield, Leidner, and Garrison (2008) focuses on how leaders can mitigate conflict, but do not direct attention to the potentially positive impact of conflict for challenging assumptions and breeding creativity (Farh, Lee, & Farh, 2010; McAvoy & Butler, 2009). Meanwhile, Kayworth and Leidner (2002) primarily look at how leaders can promote cohesion in distributed teams, but do not consider the potentially negative impact of excessive levels of cohesion. Other authors such as Denison, Hooijberg, and Quinn (1995) and Zhang, Waldman, Han, and Li (2015) have also previously pointed to the need for addressing organizational tensions such as cohesion and conflict. However, existing ISD literature has yet to analyse the organizational tension between cohesion and conflict, particularly in relation to how leadership must manage and respond to the need for both to ensure team performance.

The significance of certain concepts only emerged from the in-depth case study findings and the researcher's growing comprehension of the research objective and research questions; hence why some concepts such as team leadership and team performance were not investigated until later in the dissertation. The appearance of these concepts later in the dissertation is therefore indicative of the iterative approach to theory building, rather than any predetermined choice. In addition, the concept of wickedness underlies all chapters in the dissertation although not explicitly mentioned in some chapters.

1.4. Dissertation Roadmap

This dissertation consists of a selection of four peer-reviewed papers that were previously published in the proceedings of leading international conferences in the IS field including the International Conference on Information Systems (ICIS), the Hawaii International Conference on Systems Science (HICSS), and European Conference on Information Systems (ECIS). The roadmap sets out the structure of these published papers in the dissertation and clarifies the contributions that each paper makes to the overall research objective of the dissertation, as well as their contribution to existing academic literature and the wider ISD practitioner community.

Part	Chapter	Chapter Title	Purpose	Publication Outlet
I	1	Introduction	Provides a high-level introduction to the dissertation (research background, research objective, research questions, and dissertation roadmap) and sets out the forthcoming chapters.	N/A
	2	Background	Provides a review of existing literature across key areas of study and identifies areas which the dissertation will aim to investigate.	N/A
	3	Theoretical Development	Investigates the relationship between concepts using logical propositions from existing literature.	N/A
	4	Methodology	Presents an overview of the paradigm choice, research method, research strategy, and research process. Justifies the appropriateness of this methodology and how it was operationalised.	N/A
II	5	A Typology for Organizational ICT Practice	Presents the first iteration of the theoretical framework (RQ1) based on preliminary findings from case study 1 (the CHP project).	HICSS 2017
	6	Towards a Framework for Shared Understanding and Shared Commitment in Agile Distributed ISD Project Teams	Investigates RQ2 based on in-depth findings from case study 1 (the CHP project). The findings also provide further insights into RQ1.	ECIS 2019
	7	Theorising Antecedents of Cohesion and Conflict in Distributed ISD Project Teams	Investigates RQ3 based on in-depth findings from case study 2 (the Athena Project). The findings also provide further insights into RQ1 and RQ2.	ICIS 2018
	8	Distributed ISD Team Leadership and the Paradox of Cohesion and Conflict	Investigates RQ4 based on in-depth findings from case study 3 (the CDSS Project). The findings also provide further insights into RQ1, RQ2, and RQ3.	HICSS 2019
	9	Cross-case Analysis	Cross-case Analysis (RQ1-4) of CHP, CDSS, and Athena Project.	Target: EJIS and Research Policy
III	10	Conclusion and Implications	Summarises the conclusions arising from the preceding chapters and the theoretical, methodological, and practical contributions.	N/A

Table 1: Outline of the Dissertation Roadmap

The dissertation roadmap is outlined in Table 1 and provides a brief description of the purpose and contributes of each chapter. This dissertation is structured according to four main parts: (1) the research overview, (2) the factors which affect team interactions in distributed ISD projects (RQ1, RQ2, RQ3 and RQ4), and (3) contributions and implications of the research.

Part 1 of the dissertation provides a foundation for the dissertation and describes a high-level outline of the dissertation. Part 1 consists of four chapters. **Chapter 1** presents an introduction and sets out a background to the research, the research objective, associated research questions, and justification on why the dissertation seeks to address these research questions. This first chapter also serves as a roadmap for the dissertation in order to guide the reader on the structure of the dissertation and the contribution of each chapter. **Chapter 2** builds on the research areas identified in the introduction and provides a more comprehensive review of existing literature. In particular, the chapter begins by reviewing literature on the fundamentals of information systems development (ISD), distributed ISD project team interactions. The chapter summarises the contributions of existing literature and identifies opportunities for further research across each area.

Chapter 3 in turn details the theoretical development undertaken in this dissertation which uses logical propositions from existing literature to investigate the relationship between the macro- and micro-level factors which affect team interactions. The theoretical development draws on the seminal works of Parsons (1951) and Bourdieu (1977), and related literature on the concepts of structure, identity, and culture (macro-level) and vision, approach, and means (micro-level) to provide insights into the factors which affect team interactions, prior to empirical research. The impact of these factors on cohesion and conflict in distributed ISD projects is discussed alongside the works of Latour (2007) which is drawn on to provide insights into the dynamic interplay between macro- and micro-level factors.

Chapter 4 presents the methodology adopted in this dissertation, including the research paradigm, research method, research strategy, and data collection and data analysis techniques. For instance, the dissertation follows an interpretivist paradigm and adopts a qualitative research method in order to examine the aforementioned research questions. An interpretivist paradigm was adopted to gain insights into the interplay between macro-level and micro-level phenomena during distributed ISD team interactions through interpretative understanding. Meanwhile, a qualitative method was adopted as it enabled the researcher to elicit detailed accounts of individuals' actions, experiences, and perspectives in their natural setting (Cavaye, 1996; Yin, 1994). In addition, the section outlines the multiple in-depth case study research strategy. The research strategy includes a description of the case sampling, and a rationale for selecting each of the three case studies. Brief descriptions of the cases are also provided. Meanwhile, empirical findings from the cases were triangulated using three primary data collection techniques: participant observations, interviews and project documents. This selection of data collection techniques was possible as the researcher was a member of the ISD team for the specified duration of the case study and was present on-site at participants' locations. The chapter concludes by outlining how coding and vignettes were used as techniques to analyse the data.

Part 2 of the dissertation consists of five chapters and begins by addressing RQ1 and RQ2 - looking at how the interplay between macro- and micro-level factors affect team interactions in distributed ISD projects. **Chapter 5** presents the first iteration of the theoretical framework developed in the dissertation based on a preliminary analysis of empirical data from case study 1 (the CHP project). Case study findings from the CHP project are presented in order to offer illustrative examples which support theory building. Chapter 5 is based on a paper published in the conference proceedings of the Hawaii International Conference on Systems Science (HICSS), 2017. The paper seeks to answer research question 1 by drawing on key concepts from the field of sociology in order to gain a deeper understanding into how the social and the material come together in organizational practices. The paper asserts the need to make a much needed return to the seminal literature of Parsons (1951) and Bourdieu (1977) in order to regain some of the richness from the discourse on practice. The first iteration of the theoretical framework draws closely on complementary insights from the seminal works of Parsons (1951) and Bourdieu (1977) to look at how the continuous interplay between macro- and micro-level factors and interactions between team members and objects in the field of practice.

Chapter 6 presents and discusses findings from the first in-depth case study “the CHP project” using the evolving theoretical framework outlined in Chapter 5 to guide the analysis, as relevant to research question 2. Chapter 6 is based on a paper published in the conference proceedings of the European Conference on Information Systems (ECIS), 2019. In this chapter the second iteration of the theoretical framework is presented which clarifies the phenomena that will be investigated (i.e. starting with cohesion in the form of shared understanding (SU) and shared commitment (SC)). The theoretical constructs are renamed slightly to move away from the language of Parsons and Bourdieu while still preserving the meaning behind these constructs. The theoretical framework is used to discuss some of the macro- and micro-level factors which make shared understanding and shared commitment challenging in distributed ISD project teams.

Chapter 7 presents and discusses findings from the second in-depth case study “The Athena project” by applying the evolving theoretical framework to analyse findings as relevant to research question 3. Chapter 7 is based on a paper published in the conference proceedings of the International Conference on Information Systems (ICIS), 2018. In this chapter, the third iteration of the theoretical framework is presented which begins to consider the tension between both cohesion and conflict in distributed ISD project team interactions. This iteration of the theoretical framework recognises that cohesion (i.e. shared understanding and shared commitment) does not fully encapsulate team dynamics in distributed ISD projects, and conflict must also be considered in order to gain a deeper appreciation of how team members interact. The paper also points to the 'double-edged sword' of cohesion and suggests that periods of conflict is also needed to mitigate differences between team members from diverse contextual backgrounds.

Chapter 8 presents and discusses in-depth case study findings from the third and final in-depth case study "The CDSS project" by applying the third iteration of the theoretical framework to analyse findings. Chapter 8 is based on a paper published in the conference proceedings of the Hawaii International Conference on Systems Science (HICSS), 2019. Chapter 8 directs attention towards how team leaders employ different styles of leadership in order to effectively navigate the paradox of cohesion and conflict. The team leadership styles outlined in Quinn's (1988) Competing Values Framework are used to guide an analysis of the CDSS project team leader's responses to the paradox of cohesion and conflict. In addition, the discussion also posits how Quinn's (1988) leadership styles might relate to the macro-level and micro-level factors in our theoretical framework. Based on this discussion, propositions are put forward which can be investigated by future research.

Chapter 9 provides a cross-case analysis of the three aforementioned cases: CHP project, Athena Project, and CDSS project. This expansive chapter addresses research question 4 by investigating how different leadership styles leverage (or fall prey) to the macro- and micro-level factors which affect cohesion and conflict in distributed ISD projects. The discussion suggests that while some leaders may see macro- and micro-level factors as static attributes of the environment, others recognise that these factors can be leveraged depending on situational demands. The concept of 'leadership intelligence', first described in chapter 8, is explored in more detail as characteristic of team leaders that can leverage macro and micro-level factors for balancing cohesion and conflict. Chapter 9 draws on Quinn's (1988) team leadership styles and the third iteration of the theoretical framework presented in Chapter 7 and 8 in order to provide a cross-case analysis of the research question. Furthermore, Chapter 9 puts forward a set of propositions around styles of team leadership and perspectives of ISD project team performance which can be investigated by future research. Content from chapter 9 is being prepared for submission to the European Journal of Information Systems and the Research Policy Journal.

Part 3 of the dissertation consists of one chapter, **Chapter 10**, which presents a conclusion to the dissertation findings outlined in previous chapters, alongside the emerging contributions and implications from the dissertation. Firstly, a conclusion of the dissertation findings related to each research question are discussed in turn. Theoretical, methodological, and practical contributions from the dissertation are then summarised as relevant to the research questions. The chapter also provides an overview of the implications for practitioners arising from the dissertation and how the findings and theoretical framework can be used to enhance distributed ISD practices going forward. Finally, Chapter 10 outlines limitations and opportunities for future research emanating from the dissertation.

Figure 1 illustrates the relationship between the parts and chapters of the dissertation.

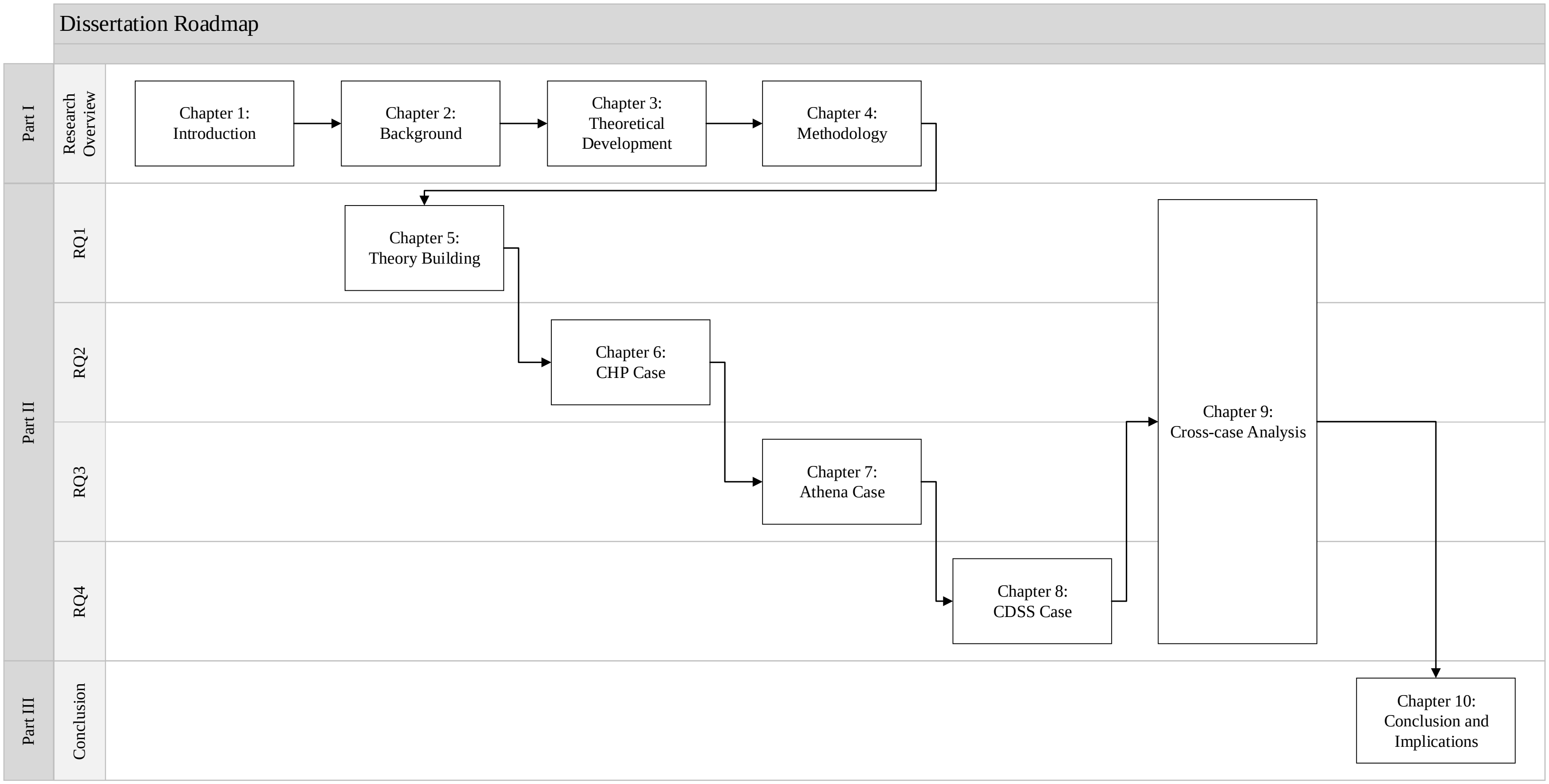

Figure 1: Dissertation Roadmap

1.5. Conclusion

Chapter 1 provides a high-level introduction to the dissertation by setting out the research background, research objective, and research questions. The chapter begins by asserting that distributed ISD projects may not be as straightforward as one might assume at face value; for instance, distributed ISD projects are often characterised by inherent complexity or ‘wickedness’ stemming from the organizational tension between cohesion and conflict in team interactions. This in turn creates challenges for distributed ISD teams in how they interact during an ISD project. Based on the research avenues identified in the introduction, the research objective is outlined as follows:

To explore how cohesion and conflict co-exist and co-evolve in distributed ISD project team interactions.

Three research questions are then formulated with a view to achieving this research objective. The research questions are:

RQ1. What factors affect team interactions in distributed ISD projects?

RQ2. How do these factors interplay with team interactions in distributed ISD projects to affect shared understanding and shared commitment?

RQ3. What is the relationship between cohesion, conflict, and team performance in distributed ISD projects?

RQ4. What is the role of distributed ISD project team leadership in leveraging cohesion and conflict?

Chapter 1 also provides a high-level overview of the dissertation by clarifying the structure of the remaining chapters and how they relate to each other. The chapters are grouped into four parts, which primarily revolve around the research questions outlined. Table 1 offered a short description of each chapter and its relative contribution, while Figure 1 illustrated the overall dissertation roadmap.

In summary, the roadmap notes that Chapters 1 to 3 will present a high level overview of the dissertation including a literature review, research design, and background motivation. Chapters 4-8 then address RQ1, RQ2, RQ3, and RQ4 by investigating how the interplay between macro-level and micro-level factors effects team interactions in distributed ISD project teams, and how teams leverage these macro- and micro-level factors which affect team interactions. The dissertation is drawn to a close in Chapter 10 by presenting the conclusions and implications of the dissertation. Chapter 10 also clarifies the contributions made by each chapter to the research questions, and presents limitations as well as suggestions for future research.

Chapter 2: Background

Chapter 2 provides foundational knowledge to guide the conduct of research relevant to the research objective and research questions. A review of existing literature is undertaken in order to provide a general background to the dissertation, outline interesting avenues of research, and identify opportunities for further research based on current literature. In particular, the section is divided into three sections outlined below, each aimed at delving deeper into related areas of existing literature:

Section 2.1. begins by outlining the fundamentals of Information Systems Development (ISD) and identifies the different streams of research presented in ISD literature to date. In particular, the important work of Hassan and Mathiassen (2018) is drawn upon to outline the current landscape of ISD literature as a body of knowledge and identify potential directions of future research. The next subsection turns attention to ISD projects as a unique instantiation of ISD practice and categorises the differences between co-located and distributed ISD project teams, as well as the specific implications of 'wickedness' in distributed ISD project teams. The final subsection provides an overview of literature on ISD project team performance, looking at contrasting perspectives of what team performance means in literature. The balanced IS scorecard is presented as a way of representing different perspectives of team performance, offering insights into both objective and subjective measures of team performance.

Section 2.2. looks at the nature of team interactions in distributed ISD projects, and reviews literature on cohesion and conflict within the context of distributed ISD team interactions in particular. Competing bodies of literature point to the deep-seated tensions that distributed ISD project teams face between the need for both cohesion and conflict in order to ensure team performance. In addition, different sources of literature from the fields of IS and organizational studies are drawn on to further differentiate cohesion and conflict as either ‘task’ or ‘social’ in nature. The potentially constructive and destructive nature of both task and social dimensions of cohesion and conflict are investigated based on findings from IS literature and reference disciplines in order to gain insights into the implications for team performance. Finally, ISD team leadership is presented as a unique form of team interaction based on the work of Quinn (1988) and related literature by other authors in the IS field. The issue of team leadership in distributed ISD project is an important one to consider given the specific difficulties leaders often face when interacting with team members from different organizational and geographical backgrounds.

2.1. Fundamentals of Information Systems Development

Information Systems Development (ISD) is an organizational practice comprising of both product (i.e. IT artefact) and process (i.e. development methodology) elements, which are situated within a dynamic context (Fitzgerald, Russo, & Stolterman, 2002; Hassan & Mathiassen, 2018). Building on their systematic review of literature, Hassan and Mathiassen (2018, p. 178) define ISD as “the integrated social and technical practices of conceptualizing and realizing information technology-based systems, and managing the associated changes and implications to accomplish specific goals in organizational contexts”. Similarly, Hirschheim, Klein, and Lyytinen (1995) place equal emphasis on the social and technical aspects of ISD by describing how individuals and groups involved in ISD seek to change “object systems” based on their underlying understandings, intentions, and values.

Hassan and Mathiassen (2018) identify three core streams of ISD research in existing literature: (i) ISD Management, (ii) ISD Performance, and (iii) ISD Framework. Furthermore, they divide each stream of research into a number of related subtopics (see Figure 2). ISD Management mainly focuses on the study of social interactions between participating actors in the ISD practice and the process of coordinating and organising ISD (i.e. people management and project organising). Examples of literature in this stream of ISD research include: Robey, Smith, and Vijayasarathy (1993), Barki and Hartwick (2001), and Kotlarsky and Oshri (2005). ISD Performance is primarily product-oriented and looks at issues related to the technical IS artefact (i.e. implementation and evaluation). Examples of literature in this stream of ISD research include: Beaudry and Pinsonneault (2005), Doolin (2004), and DeLone and McLean (2003). Finally, the ISD Framework stream looks at the principles of ISD practice and builds abstractions around the different levels of practice (i.e. ISD tools and paradigms). Examples of literature in this stream of ISD research include: Fitzgerald, Hartnett, and Conboy (2006), Hevner, March, Park, and Ram (2004), and Conboy (2009).

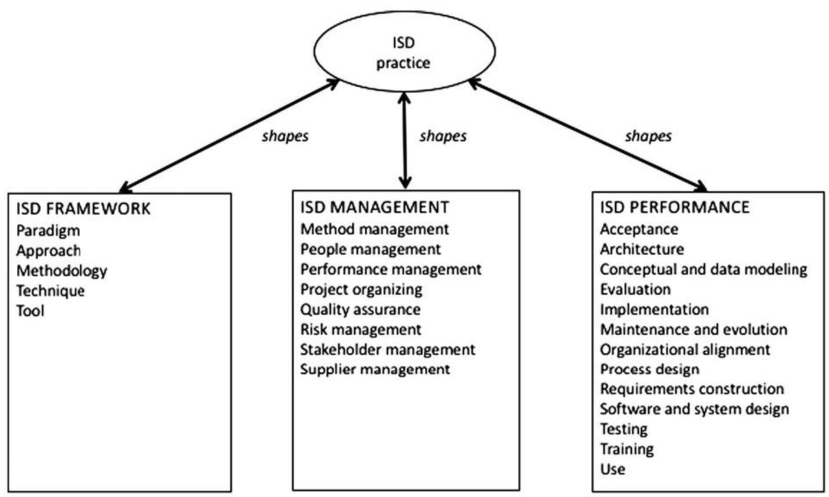

Figure 2: Canonical Map of Disciplinary ISD knowledge (Source: Hassan and Mathiassen (2018))

Based on Hassan and Mathiassen's (2018) in-depth analysis of the citation classics, around 84% of ISD research efforts to date has been directed towards the ISD Performance stream. In contrast the ISD Management and ISD Framework streams have received considerably less attention. **This suggests that there is significant scope to direct increased research efforts towards the ISD**

Management and ISD Framework streams. In particular, Kotlarsky and Oshri (2005) assert that expanding our breadth of knowledge on the social aspects of ISD management in distributed settings is essential for understanding how ISD project managers can improve team performance in increasingly volatile contexts. This goes beyond the evaluation of ISD performance alone and requires dedicated and focused attention to be directed towards the social interactions between individuals and groups (Lim, Sia, & Yeow, 2011; Sawyer, Guinan, & Cooprider, 2010).

The next subsection looks at ISD projects as a specific instantiation of ISD practice in order to gain an appreciation of the unique characteristics of these undertakings.

2.1.1. Information Systems Development (ISD) Projects

ISD projects are a unique instantiation of ISD practice formed to achieve a particular objective within the bounds of a set timeframe (Pee, Kankanhalli, & Kim, 2010; Xia & Lee, 2005). ISD projects provide a key mechanism for organizations to develop novel IT artefacts. They differ considerably to other types of ISD practices, such as those conducted by organizational departments. Whereas the configuration of organizational ISD departments usually persists beyond the development of an IT artefact, ISD project teams are more fleeting in nature and team members are usually disbanded after the project's final deadline has passed. The Project Management Institute (PMI, 2018) defines projects as temporary undertakings which are bounded by inherent constraints such as a set beginning and end time, and defined scope and resources. For instance, an ISD project typically consists of a set of interconnected tasks which must be completed within a limited timeframe, budget, and scope (PMI, 2000). These ISD project tasks involve the enactment of numerous activities such as planning, analysis, design, development, and testing as well as the delivery of outputs which can take the form of artefacts (both abstract and concrete) or planned actions (Avison & Fitzgerald, 2003; PMI, 2000).

The client of an ISD project can also inherently shape the conduct of ISD projects (Kirsch, Sambamurthy, Ko, & Purvis, 2002). For instance, ISD project tasks could be shaped by an internal business owner within the organization (Kirsch, Sambamurthy, Ko, & Purvis, 2002), an external customer or sponsor who has contracted the ISD project team to develop an IT solution on their behalf (Jun, Qiuzhen, & Qingguo, 2011), or an external collaborator. Deliverables are produced with the aim of capitalising on an opportunity or tackling a problem identified by the client; in particular, ISD projects are typically undertaken to respond to opportunities and problems, which cannot be addressed through the organization's everyday operations (PMI, 2000). ISD projects are well suited to the pursuit of strategic goals as they allow an organization to create a targeted scope, budget, and team composition for achieving the goal in question (PMI, 2000). For instance, an ISD project could seek to develop new IS solutions which strategically differentiate the organization from their competitors (Galliers, 1991).

ISD projects are also inherently shaped by the organizational environment in which they are conducted (Russo, Fitzgerald, & Shams, 2013; Wynekoop & Russo, 1997). For instance, the organizational environment imposes requirements on an ISD project which the IT artefact under development must cater to, such as ongoing changes in organizational structures and business processes (Xia & Lee, 2005). This requires high levels of business-IT alignment to ensure that the ISD project can plan and adapt to business requirements in the form of system scope changes (Kearns & Sabherwal, 2006). The organizational environment can also shape the 'flexibility' and 'agility' (cf. Conboy, 2009) of ISD projects; for instance, ISD projects conducted in organizations with a high level of IT maturity can potentially benefit from software modularity which supports greater levels of flexibility and agility in software development (Ross, 2003; Scott, 2007). However, in contrast, an organization with very low IT maturity may have limited access to prior ISD resources and capabilities upfront, thus limiting flexibility and agility at the project's outset.

ISD projects have traditionally been conducted by co-located teams consisting of individuals situated in the same physical location (Jarvenpaa, Shaw, & Staples, 2004; Powell, Piccoli, & Ives, 2004). However, more recently, there has been an increasing trend towards distributed ISD project teams (also known as virtual teams) consisting of individuals from diverse geographical, temporal, organizational, and disciplinary backgrounds (Ågerfalk, Fitzgerald, Holmstrom Olsson, Lings, Lundell et al., 2005; Ågerfalk, Fitzgerald, & Slaughter, 2009; Kotlarsky & Oshri, 2005; Powell, Piccoli, & Ives, 2004; Sarker & Sahay, 2003). For instance, distributed ISD project teams typically bring together individuals from distinct geographical regions which create temporal distances as team members cannot interact face-to-face (Ågerfalk, Fitzgerald, Holmstrom Olsson, Lings, Lundell et al., 2005). This has been made possible by the availability of sophisticated Information Communication Technology (ICT) (e.g. email, video conferencing, instant messaging, and groupware) which allow distributed ISD project team members to collaborate regardless of their physical location (Kotlarsky & Oshri, 2005; Kudaravalli & Faraj, 2011). In addition, distributed ISD project teams typically consist of team members from different disciplines such as computer science, project management, business, and design. Distributed ISD project team members may also come from different organizations who work together to deliver an IT artefact (Levina, 2005).

There are inherent differences between the characteristics of co-located and distributed ISD project teams. Firstly, co-located ISD project teams are typically afforded more opportunities to engage in face-to-face communication compared to distributed ISD project teams, as the barrier to face-to-face communication is lower (McDonough III, Kahn, & Barczak, 2001; Powell, Piccoli, & Ives, 2004). Co-located ISD project teams are less reliant on virtual mediums to engage in formal and informal communication which reduces response times during interactions. In contrast, distributed ISD project teams are more reliant on asynchronous communication mediums such as email which in turn can impede knowledge sharing and trust among team members due to delayed response times (Breu & Hemingway, 2004; Jarvenpaa & Leidner, 1999; J. B. Walther, 1995). In addition, co-located ISD project teams are able to utilise traditional forms of monitoring and control such as direct supervision within a known physical space. Distributed ISD project teams in contrast may find it more difficult to closely monitor and control the work of team members, leading to perceptions of risk around social loafing and absenteeism among team members (cf. Jarvenpaa, Knoll, & Leidner, 1998; Robert, Denis, & Hung, 2009).

Prior studies on the performance of distributed and co-located teams have provided seemingly contradictory evidence on the relative advantages and disadvantages of each. While some studies have suggested that co-located teams tend to outperform distributed teams, others have offered contradicting evidence which disputes this (Breu & Hemingway, 2004; Espinosa, Slaughter, Kraut, & Herbsleb, 2007; Garrison, Wakefield, Xu, & Kim, 2010; Gupta, Mattarelli, Seshasai, & Broschak, 2009). However, in general most studies suggest that while distributed ISD teams may perform poorly early on, they reach similar levels of performance to that of co-located teams once they have worked together for longer periods of time (Gupta, Mattarelli, Seshasai, & Broschak, 2009). For instance, Gupta, Mattarelli, Seshasai, and Broschak (2009) find that there is not a statistically significant difference between the performance of distributed and co-located teams in commercial settings. Meanwhile, Garrison et al.'s (2010) study of global distributed ISD teams finds that while the level of diversity in the team can negatively impact individual performance, these performance issues can be overcome when the level of trust increases among the team.

Consequently, distributed ISD projects are often characterised by considerable social challenges due to budding tensions between individuals and groups within the ISD team (Ågerfalk, Fitzgerald, Holmstrom Olsson, Lings, Lundell et al., 2005; Ågerfalk, Fitzgerald, & Slaughter, 2009; Luna-Reyes, Zhang, Gil-García, & Cresswell, 2005). In particular, distributed project teams can face inherent challenges in relation to knowledge sharing, learning, collaboration, and the management of knowledge (Gardner, Gino, & Staats, 2012; Majchrzak, More, & Faraj, 2012). For instance, Edmondson and Nembhard (2009) point to numerous studies which have suggested that the temporary and disparate nature of distributed project teams can make it more challenging for team members to integrate knowledge, especially in instances where team members have not previously worked together. Bartsch, Ebers, and Maurer (2013) also point to the challenges of transcending boundaries in project-based organizations given the impediments to making project-level knowledge centrally available to everyone in the organization.

Research suggests that diversity in distributed ISD teams may have a mixed impact on performance. Harrison, Price, Gavin, and Florey (2002) assert that while team diversity can help challenge team members to generate more creative solutions, deep-level diversity (i.e. culture, identity) can have a negative impact on team performance in the long term (over and above that of surface-level diversity characteristics such as age, ethnicity, and gender). Meanwhile, Daniel, Agarwal, and Stewart (2013) suggests that while cultural diversity can negatively impact engagement in distributed ISD teams, it can positively impact on the market success of an IT artefact.

Gaining an appreciation of the various challenges that distributed ISD teams face can therefore help practitioners strengthen the emergent processes of communication, sense-making and negotiation around the proposed system (Levina, 2005; Luna-Reyes, Zhang, Gil-García, & Cresswell, 2005). For instance, Kotlarsky and Oshri (2005) assert the importance of investigating social aspects of distributed ISD projects in order to support more successful collaborations. The next subsection looks at the challenges faced by distributed

ISD project teams in more detail and draws on literature around the concept of 'wickedness' to gain further insights.

2.1.2. Aspects of 'Wickedness' in Distributed ISD Projects

The conduct of distributed ISD projects is often characterised by inherent complexity or 'wickedness' as individuals must continuously interact, share ideas, resolve conflict, and coordinate resources in order to deal with high levels of socio-technical change (Hsu, Chu, Lin, & Lo, 2014; Sawyer, Guinan, & Cooprider, 2010; Xia & Lee, 2005; Yeh, 1991). The concept of 'wickedness' describes seemingly irreconcilable social differences between groups involved in decision-making processes, where the task and contextual information needed to arrive at a solution is incomplete and always changing (Conklin, 2005; Farrell & Hooker, 2013; Rittel & Webber, 1973). Wickedness deals with scenarios where there are no definitive conditions which would allow the team to objectively judge a problem or solution as right or wrong (Buchanan, 1992). Cross (1984, p. 102) argues that in such cases "stating the problem is the problem" and therefore an ISD team's main task concerns the conception of the 'artificial', or planning for IT solutions which are ill-defined (Buchanan, 1992; Simon, 1969, 1973). Mason and Mitroff's (1973, pg. 479) highly cited research program on management information systems **calls for increased attention to be directed towards the concept of wickedness**, arguing that "real management design or decision problems appear overwhelmingly wicked".

Figure 3 illustrates how wickedness can emanate from one of more of the following aspects: social, task, and contextual aspects (Conklin, 2005; Ketter, Peters, Collins, & Gupta, 2016; Schoder, Putzke, Metaxas, Gloor, & Fischbach, 2014). Wickedness in distributed ISD projects is not a broad, catch-all notion and instead consists of multiple dimensions. For instance, distributed ISD projects may be characterised by high levels of wickedness around one or more of the following: (1) social aspects concerning the interactions between team members; (2) task aspects related to the development of new IT artefacts; and (3) contextual aspects related to the organizational environment.

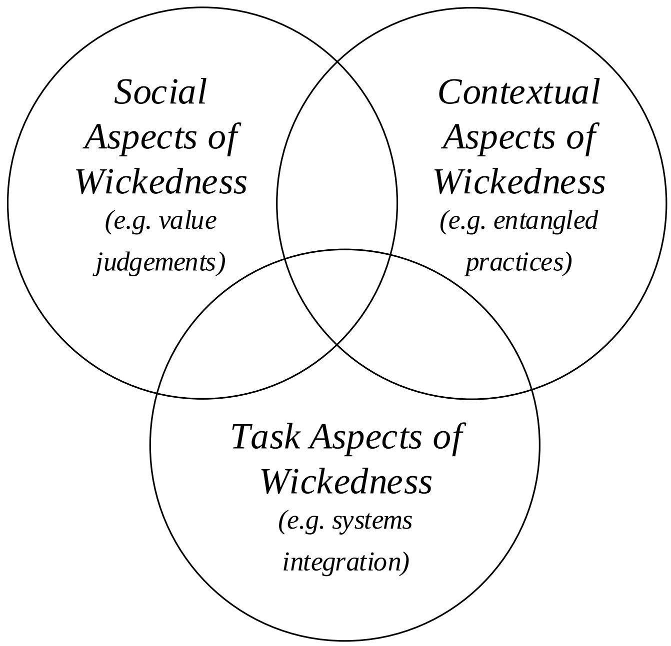

Figure 3: Aspects of Wickedness

2.1.2.1. Social Aspects of Wickedness in ISD

Distributed ISD projects teams must collaboratively build new understandings around the development of a system in order to arrive at an appropriate solution within a constrained timeframe (J. Lee, Park, & Lee, 2015; Luna-Reyes, Zhang, Gil-García, & Cresswell, 2005; Sawyer, Guinan, & Cooprider, 2010). Distributed ISD projects therefore primarily concern the social construction of knowledge as distributed individuals must continuously engage in team interactions in order to share and integrate the knowledge required for systems development (Aladwani, 2002a; J. Lee, Park, & Lee, 2015; Sawyer, Guinan, & Cooprider, 2010). However, this process of sense-making and negotiation around the proposed system can be impeded by disagreements between distributed ISD team members from different organizational and disciplinary backgrounds who each come with different perspectives, intentions, and values (Levina, 2005; Luna-Reyes, Zhang, Gil-García, & Cresswell, 2005).

For instance, disagreements can arise in a distributed ISD project team due to the differences in value systems, interests, and positions (Barki & Hartwick, 2001; Luna-Reyes, Zhang, Gil-García, & Cresswell, 2005; Robey, Smith, & Vijayasarathy, 1993). In order to address these social aspects of wickedness, ISD project team members must continuously share knowledge, and challenge the underlying assumptions of others within the group (Weber & Khademian, 2008). Social aspects of systems development have been highlighted as a critical area of research which distinguishes ISD literature from the software engineering body of knowledge (Hassan & Mathiassen, 2018; Luna-Reyes, Zhang, Gil-García, & Cresswell, 2005). These issues are typically investigated within the ISD management stream of research (e.g. the topics of people management, and stakeholder management), as outlined by Hassan and Mathiassen (2018).

2.1.2.2. Task Aspects of Wickedness in ISD

Distributed ISD projects can also be characterised by task aspects of wickedness which concern the numerous technical factors that are often outside their control of the project team (Schmidt, Lyytinen, & Mark Keil, 2001; Xia & Lee, 2005). For instance, developers are frequently tasked with integrating emergent technologies with more archaic legacy systems in an organization's pre-existing architecture. Adam and Sammon (2004) discuss the challenging task of integrating an enterprise-wide Enterprise Resource Planning package with existing legacy systems in an established organization. These types of challenges have been further discussed by literature in the 'ISD performance' stream of ISD research outlined by Hassan and Mathiassen (2018).

Xia and Lee (2005) outline IT complexity as an inherent dimension of ISD project complexity. Based on their review of existing ISD project literature, Xia and Lee (2005) provide operationalised measures of IT complexity, including: diversity of platforms, systems integration effort, installation ease, scope of programming effort, and complexity of data communication. McKeen, Guimaraes, and Wetherbe (1994) also point to additional measures of IT complexity that are specific to developers and analysts such as decisions around design techniques, computing languages, and development methodology. In addition, the ISD project may be further complicated by the integration of immature technologies, or IT platforms which have not been used in previous projects (Wallace, Keil, & Rai, 2004; Xia & Lee, 2005).

2.1.2.3. Contextual Aspects of Wickedness in ISD

Contextual aspects of wickedness arise from the complex interconnections between practices in an organization(s), where changes in one practice reverberate throughout other practices (cf. Rittel & Webber, 1973). ISD is often characterised by indeterminacy due to the many interconnected practices and ill-structured boundaries within the organizational context (Yeh, 1991). For instance, Johannesson and Perjons (2017) discuss the entanglement of practices within the context of learning content management systems by mapping the interconnections between practices such as teaching and learning, student evaluation, and staff recruitment. Based on their research, Johannesson and Perjons (2017) assert that the design and development of systems must consider the relationship between these entangled practices in order to build effective IT artefacts. Rittel and Webber (1973) also describe how wickedness can arise in contexts characterised by high-levels of socio-technical change, and argue that this affects the ways in which individuals and groups perform actions and engage in problem-solving within the confines of underlying structures in the environment (A. Newell, 1993; A. Newell & Simon, 1972).

In particular, Rittel and Webber (1973) state that in order to address contextual aspects of wickedness, planning activities must be allowed to emerge iteratively through the critical arguments of participants, and individuals and groups must be provided with an opportunity to engage in dialogical processes around the context (Rittel & Webber, 1973; Schoder, Putzke, Metaxas, Gloor, & Fischbach, 2014). Rittel and Webber (1973) viewed wickedness as an intractable phenomenon of certain contexts and did not agree with the highly analytical approach to planning and design that was proposed by other scholars at the time to understand such contexts. In particular, scholars of wickedness contend that a focus on rationality in decision making does not capture the inherent wickedness of real-life organizational contexts which are rife with fragmented perspectives and contentious value judgements (Adam & Murphy, 1995; Buchanan, 1992; Coyne, 2005; Rittel & Webber, 1973).

The next section turns attention towards ISD project team performance in order to better understand the criteria by which the performance of a distributed ISD project team will be measured.

2.1.3. Distributed ISD Project Team Performance

ISD project teams continue to record a high rate of failure (Xia & Lee, 2005). For instance, findings published by the The Standish Group (2015) in their CHAOS report suggest that 52% of ISD projects in 2015 encountered significant challenges while 19% were deemed to have failed. These results continue a long-running and disconcerting trend of ISD project failure over the last three decades (Doherty, Ashurst, & Peppard, 2012; The Standish Group, 1996, 2015). Based on this trend, Yeo (2002) outlines 'critical failure factors' for ISD projects which are categorised under three spheres of influence: (i) context driven issues (related to corporate culture, corporate management, users, and politics), (ii) process driven issues (related to tasks such as business planning, project planning, project management and control), and (iii) content driven issues (related to IT, business process and systems design, and IT/IS professional and knowledge sources). The critical failure factors identified by Yeo (2002) might also be framed as macro-level (context driven) and micro-level (process and content driven) factors which may impact ISD project performance. In particular, Doherty and King (2005) assert that human and organizational aspects of system development are key factors in explaining the rate of ISD project failure, an issue which may be ignored by system developers given their primary focus on technical issues.

A considerable body of literature has been dedicated to outlining different measurement criteria and methods for evaluating the performance of ISD project teams and IT artefacts (DeLone & McLean, 1992; Gable, Sedera, & Chan, 2008; S. Jones & Hughes, 2001). Robey, Smith, and Vijayasarathy (1993) differentiate between two core categories of performance in ISD: systems and project-level performance. Systems performance focuses on the overall impact of the developed IT artefact, as encapsulated by measurement criteria such as the perceived system quality, information quality, and the level of user satisfaction outlined by DeLone and McLean (2003) in their IS success model. Gable, Sedera, and Chan (2008) similarly assert that system performance is a multi-dimensional concept consisting of numerous sub-constructs related to individual and organizational impact, and system quality and information quality. Sub-constructs include decision effectiveness (i.e. individual impact), business process change (i.e. organizational impact), data accuracy (i.e. systems quality), and timeliness (i.e. information quality).

Meanwhile, project performance is typically defined according to performance measures of the project team (Barki & Hartwick, 2001; Robey, Smith, & Vijayasarathy, 1993; Sawyer, Guinan, & Cooprider, 2010). At an elementary level, ISD project team performance is traditionally evaluated based on the delivery of outcomes on time, within budget, and to a pre-specified scope i.e. 'the iron triangle' of project management (Ramesh, Mohan, & Cao, 2012). For instance, Maruping, Venkatesh, Thatcher, and Patel (2015) defines team performance in terms of the production of project deliverables on time, within budget, and to a high quality specification. Similarly, G. Lee and Xia (2010) define team performance in terms of on-time completion, on-budget completion, and the delivery of software functionality. De Bakker et al.'s (2010) meta-analysis of literature on IT projects asserts that two thirds of the publications analysed by the authors define team performance in terms of the 'iron triangle' where the team deliver an output on time, within budget, and to a pre-specified scope.

However, a number of authors have criticised the use of the iron triangle as the sole measure of team performance. For instance, Ramesh, Mohan, and Cao (2012) contend that within the context of distributed agile software development, team performance must also consider measures of responsiveness to change (e.g. exploration) in order to move beyond a narrow focus on the performance measures of time, budget, and scope. Atkinson (1999) also asserts the need to develop alternative perspectives on team performance in ISD projects as the iron-triangle does not provide a full understanding of the criteria needed to ensure team performance. In particular, he argues that team performance must also consider stakeholder and organizational benefits as well as the evaluation of the information system developed. According to Atkinson (1999), the proposed timeframe and budget allocation of ISD projects are usually best guesses provided upfront by management, and definitions of quality emerges over time based on the attitudes and beliefs of stakeholders. Ika (2009) also assert that the iron triangle represents just one perspective of team performance, and a project delivered on time, within budget and to a pre-defined scope may still constitute a failure if it fails to deliver long term business value.

2.1.4.1. Perspectives on ISD Project Team Performance

McLeod, Doolin, and MacDonell (2012) point to the differences between objectivist and subjectivist perspectives on project team performance in existing literature. Firstly, the objectivist view asserts that project team performance can be evaluated objectively using defined criteria, which are measured through quantitative methods such as surveys, and analysed using standardised statistical formula (Ika, 2009; McLeod, Doolin, & MacDonell, 2012). The most commonly applied objective criteria for evaluating project team performance in organizations continues to be the 'iron triangle' (Atkinson, 1999; Bryde, 2005; Ika, 2009). The iron triangle focuses primarily on objective measures of team performance in terms of whether the project is delivered on schedule, within budget, and met a pre-specified scope (Papke-Shields, Beise, & Quan, 2010).

In contrast, the subjectivist view argues that project team performance is socially constructed based on the subjective evaluation of individuals and groups (Cecez-Kecmanovic, Kautz, & Abrahall, 2014; McLeod, Doolin, & MacDonell, 2012). The subjectivist view does not assume the existence of universal performance criteria, and instead asserts that performance can only be understood based on the meanings of individuals and groups which are measured using qualitative methods such as interviews (Ika, 2009; McLeod, Doolin, & MacDonell, 2012). This allows for multiple, potentially competing interpretations of team performance within a single context. However, McLeod, Doolin, and MacDonell (2012) notes that to date, the majority of empirical studies on project team performance have followed the objectivist view which calls for increased attention toward approaches which embrace a subjectivist view.

Despite the proliferation of objective measurement criteria and methods, some IS scholars argue that the evaluation of ISD project team performance still remains an inherently subjective process, one which is shaped by the interpretations of individuals involved (Gable, Sedera, & Chan, 2008; Irani, Love, Elliman, Jones, & Themistocleous, 2005; S. Jones, 2008; S. Jones &

Hughes, 2001; Wilson & Howcroft, 2000). For instance, Robey, Smith, and Vijayasarathy (1993) find that ISD project team performance is inherently shaped by perceptions of conflict resolution where individuals reach consensus around an outcome that is agreeable to all involved. Wilson and Howcroft (2000) question the assumption that the evaluation of ISD project team performance should be viewed as a wholly objective and rational task and instead suggest that the desire of management to quantify performance can bias them to focus on the benefits of ISD over limitations. Meanwhile, Cecez-Kecmanovic, Kautz, and Abrahall (2014) assert that IS team performance is not a fixed concept, and instead actors may have conflicting perceptions of IS performance which may change over time. They further reframe IS performance as a relational effect that is performed in sociomaterial practices, and draw on case study findings to show how conflicting assessments of IS performance can co-exist at the same time.

This highlights a philosophical problem of defining ISD project team performance given the potential for contrasting perceptions of how team performance is evaluated. Actors can have diverse viewpoints around what constitutes ISD team performance, and a ISD project that constitutes a success for one individual may represent a failure for another (Cecez-Kecmanovic, Kautz, & Abrahall, 2014). Equally, some scholars have suggested that IS evaluation is shaped by the socio-political interactions between individuals and groups, and depending on inherent differences in interests, the evaluation of individuals may differ widely within a group setting (Avgerou & McGrath, 2007; Irani, Love, Elliman, Jones, & Themistocleous, 2005; S. Jones, 2008; Wilson & Howcroft, 2000). In addition, the interpretation of influential individuals may come to shape how others evaluate ISD project team performance and in the absence of critical judgement, an ISD project could be evaluated positively or negatively prima facie (Azad & Faraj, 2011; Wilson & Howcroft, 2000). However, a siloed view of ISD project team performance can be constraining; for instance, the dominant perspective of an ISD project as a failure may overlook the many successful qualities of the project in light of the social and technical complexities faced. Despite this, ISD project team performance is often evaluated using objective measures and without consideration of the potentially conflicting perspectives of different stakeholders (Agarwal & Rathod, 2006; McLeod, Doolin, & MacDonell, 2012; Papke-Shields, Beise, & Quan, 2010).

While there is limited consensus in project management literature around the criteria for judging project team performance (McLeod, Doolin, & MacDonell, 2012), there are nevertheless validated tools available which aim to combine both objective and subjective measures. In particular, the balanced IS scorecard (Martinsons, Davison, & Tse, 1999) provides a potentially valuable tool for measuring performance based on objectivist or subjectivist views. For instance, Ittner, Larcker, and Meyer (2003) describes a study where the balanced scorecard was used by a large financial services firm as a tool for subjectively and objectively evaluating performance. The next section outlines a variant of the balanced scorecard for evaluating projects called the balanced IS scorecard.

2.1.4.2. The Balanced IS Scorecard

The balanced scorecard aims to elucidate different perceptions of performance through an evaluation of multiple aspects of the working environment (R. S. Kaplan & Norton, 1996). Building on the work of R. S. Kaplan and Norton (1996), Stewart (2001) and Norrie and Walker (2004) put forward the balanced scorecard as tool for evaluating the current and future performance of projects based of four perspectives: (i) Financial, (ii) Customer, (iii) Internal Business Process, and (iv) Learning and Growth. The Financial perspective looks at factors related to the iron triangle such as whether the project came in on schedule, on budget, and whether the project was carried out effectively. The Customer perspective then looks at whether the project team delivered outputs which have been valuable to clients, if the client was satisfied with the process by which the team completed the project, and whether the project will directly benefit the intended client. The Internal Business perspective looks at the impact that the project team had on the internal processes in the business such as whether the efficiency and effectiveness of internal activities have been improved. Finally, the Learning and Growth perspective focuses on the impact of the project in regards to the development of new knowledge and transferable skills among team members, and the commercialisation of new opportunities.

The balanced scorecard has been implemented widely as a tool to assess organizational performance across numerous industry sectors. The primary benefit of the balanced scorecard is that it enables actors to judge performance based on multiple perspectives, and challenges the assumption that performance can be uniformly judged based on a single perspective, such as that of the iron triangle (R. S. Kaplan & Norton, 1996). However, one criticism levelled against the balanced scorecard is that the proposed causality between the four perspectives is unclear and potentially problematic (Norreklit, 2000). R. S. Kaplan and Norton (1996) do not define the relationship between the perspectives in any great detail which some argue can make it difficult to implement. Another limitation associated with the balanced scorecard is that it was initially intended as a strategic management tool for assessing the performance of organizations, and therefore its relevance to other domains is less clear. However, this limitation has been addressed by more recent research which has adapted the balanced scorecard to the context of projects and more specifically to ISD projects. For instance, Stewart (2001) positions the balanced scorecard as a performance measurement tool for project teams whereby the organization's standards are tied to project team evaluation. This assertion is supported by the Project Management Institute who describe projects as a key means through which organizations implement their strategy (PMI, 2000).

Stewart (2001) put forward a number of criteria which can be used to measure performance across the four perspectives of the balanced scorecard of projects, as illustrated in Figure 4. This includes objective measures such as return on investment, payback period (financial perspective), and timeliness (customer perspective), alongside more subjective measures such as lessons learned (training and innovation perspective), customer satisfaction (customer perspective), and team satisfaction (project / internal business perspective).

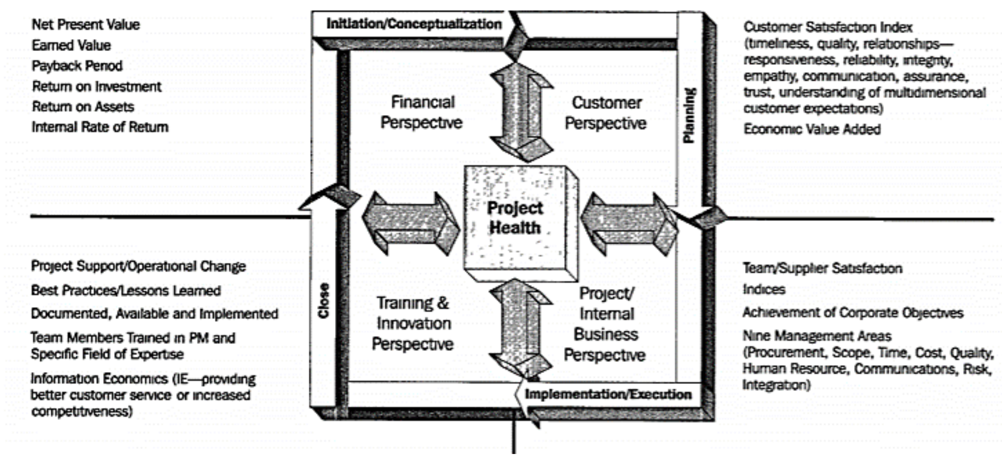

Figure 4: Examples of Tools for BSC Measurements (source: Stewart (2001))

In addition, Martinsons, Davison, and Tse (1999) have put forward the balanced scorecard as a decision tool for assessing the performance of IS project teams. Building on the works of R. S. Kaplan and Norton (1996), they offer a modified version of the balanced scorecard called “the balanced IS scorecard” which has been adapted to guide the evaluation of IS project teams. The balanced IS scorecard consists of the following four perspectives (see Figure 5): Internal Processes, User Orientation, Business Value, and Future Readiness. These are akin to the Financial, Customer, Internal Business, and Learning and Growth perspectives outlined by R. S. Kaplan and Norton (1996). The Internal Processes perspective takes an operational view of performance and measures whether IT artefacts were delivered on time, within budget, to a pre-defined scope. The User Orientation perspectives then adopts an end-user perspective and evaluates the delivery of value adding IT artefacts to end-users. The Business Value perspective further focuses on the views of management and evaluates whether a project contributes to the value of a business. Finally, Future Readiness adopts an innovation and learning view by evaluating the team's adaptability to changes and challenges in the future.

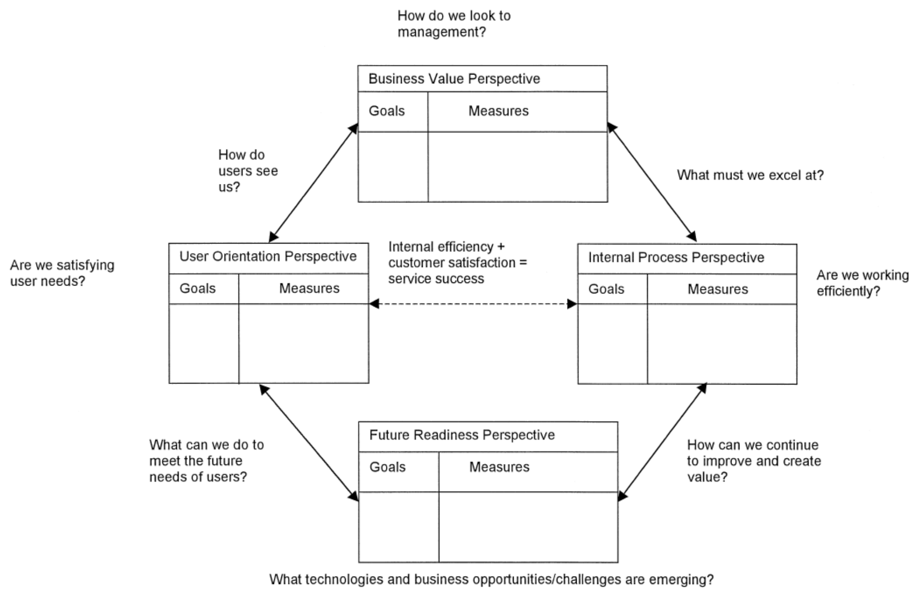

Figure 5: The Balanced IS Scorecard (source: Martinsons, Davison, and Tse (1999))

However, there are opportunities for future research to investigate distributed ISD project team performance and how this can be addressed through the effective team leadership. For instance, Aggarwal (2014) identifies opportunities for future research in studying the performance of 'swift teams' within distributed settings, specifically investigating the impact of diversity and leadership on team performance. Distributed ISD project teams are often assembled on an ad-hoc or 'swift' basis to respond to unprecedented opportunities or risks. This can create inherent challenges around how team members interact due to high levels of team diversity (i.e. functional diversity related to task-related knowledge and skills), and the lack of a collective identity between team members (Aggarwal, 2014; X. Yang, Tong, & Teo, 2015).

Furthering our knowledge of distributed ISD team interactions can therefore help address these significant challenges around project team performance (Aggarwal, 2014; X. Yang, Tong, & Teo, 2015). The next section looks at distributed ISD team interactions in more detail.

2.2. Understanding Distributed ISD Team Interactions

According to Sawyer, Guinan, and Cooprider (2010), ISD can be studied from five different perspectives: the (i) *production perspective* which centres on study of methods, techniques and tools (Fitzgerald, Russo, & Stolterman, 2002; Wynekoop & Russo, 1997); (ii) the *individual perspective* which focuses on the contributions of individual team members (Sheil, 1981); (iii) the *political perspective* which looks at power relations among stakeholders (Hekkala & Urquhart, 2013; Jasperson, Carte, Saunders, Butler, Croes et al., 2002); (iv) the *contextual perspective* which investigates organizational competitiveness, the industrial environment, managerial skills, and resources (Avgerou, 2001); and (v) the *social perspective* which centres on the study of interactions between team members (Doherty & King, 2005; Kotlarsky & Oshri, 2005). This dissertation follows the social perspective of ISD, which seeks to gain insights into how distributed ISD project teams work together in order to develop IS solutions through dialogue, knowledge sharing, and collaboration. Specifically, the dissertation investigates team interactions that centre on how team members exchange knowledge in order to reach or break shared understanding and shared commitment (cf. Chiravuri, Nazareth, & Ramamurthy, 2011; Sawyer, Guinan, & Cooprider, 2010; Walz, Elam, & Curtis, 1993). This view of distributed ISD projects in turn provides focused insights into the emergence of cohesion and conflict during team interactions.

Table 2 provides a preliminary overview of literature from highly ranked journals and leading conferences in the field of information systems. The data sources and search strategy were guided by the work of Bandara, Miskon, and Fielt (2011) and Webster and Watson (2002). Firstly, the search period was limited to articles published in the last thirty years, between 1988 and 2018. ‘Primary papers’ were identified by searching the title, abstract and keywords of relevant papers, while ‘secondary papers’ were found by searching the body of the article (Bandara, Miskon, & Fielt, 2011). The following search engines were used: Google Scholar, ProQuest, EBSCOhost Business Source Complete, and JSTOR. Meanwhile, the researcher used the following search criteria: “information systems”, “development”, “teams”, “cohesion”, “conflict”, “shared understanding” and “shared commitment”.

The remainder of this section draws on insights from the literature outlined in Table 2. In addition, relevant literature from the reference disciplines of psychology and social science are drawn on through a forward and backward search of literature (Webster & Watson, 2002). The dissertation focuses on the task and social dimensions of cohesion and conflict, as per the works of other scholars (cf. De Dreu & Weingart, 2003; De Wit, Greer, & Jehn, 2012; Kankanhalli, Tan, & Wei, 2006). Literature on process cohesion and process conflict are not included in the review as following Windeler, Maruping, Robert, and Riemenschneider (2015) and Barki and Hartwick (2004), these were seen as sub-dimensions of task-based cohesion and conflict. For instance, Barki and Hartwick (2004) asserts that task conflict resolves around ‘what’ tasks must be done and ‘how’ a task is performed; therefore, process conflict is viewed as a component of task conflict and is not considered separately.

Author	Year	Source	Cohesion	Conflict
Barki and Hartwick	2001	MIS Quarterly		X
Bittner and Leimeister	2014	Journal of Management Information Systems	X	
Briggs et al.	2005	Americas Conference on Information Systems	X	
Carte and Chidambaram	2004	Journal of Association of Information Systems	X	X
Chidambaram	1996	MIS Quarterly	X	
Chidambaram et al.	1990	Journal of Management Information Systems	X	X
Chiravuri et al.	2011	Journal of Management Information Systems	X	X
Garrison et al.	2010	The Data Base for Advances in Information Systems	X	
He et al.	2018	Hawaii International Conference on System Science	X	X
Hummel et al.	2016	European Conference on Information Systems	X	
Kankanhalli et al.	2006	Journal of Management Information Systems		X
McAvoy and Butler	2009	European Journal of Information Systems	X	X
Osborn and Paul	2018	Hawaii International Conference on System Science		X
Paul et al.	2004	Journal of Management Information Systems		X
Powell et al.	2004	The Data Base for Advances in Information Systems	X	
Robey et al.	1993	Journal of Management Information Systems		X
Wakefield et al.	2008	Information Systems Research		X
Windeler et al.	2015	Journal of Association of Information Systems	X	X
Yang et al.	2015	Journal of Association of Information Systems	X	

Table 2: IS Literature on Cohesion and Conflict in Distributed ISD Teams

2.2.1. Team Cohesion

Team cohesion can be defined as the extent to which team members possess a shared understanding of and a shared commitment to the project (Thatcher & Patel, 2011; X. Yang, Tong, & Teo, 2015). Shared understanding is defined as "the degree to which people concur on the value of properties, the interpretation of concepts, and the mental models of cause and effect with respect to an object of understanding" (Bittner & Leimeister, 2014, pg. 115). Meanwhile, shared commitment requires team members to dedicate resources towards the delivery of proposals that have gained shared understanding (Briggs, Kolfschoten, & Vreede, 2005; Conklin, 2005; X. Yang, Tong, & Teo, 2015). Bittner and Leimeister (2014) find that shared understanding is essential to the cohesiveness of team members' interpretations and perspectives within heterogeneous groups, and the overall level of team performance. Similarly, Van den Bossche, Gijselaers, Segers, and Kirschner (2006) frame shared commitment as a key element of cohesion. Shared commitment impacts team members' ability to collectively achieve goals through cohesiveness around the tasks that need to be completed. Shared understanding and shared commitment are seen as interdependent facets of team cohesion; for instance, shared commitment cannot arise in the absence of shared understanding, but shared understanding alone is not enough to ensure high levels of team performance (Conklin, 2005).

Literature differentiates between two forms of team cohesion: task cohesion and social cohesion, which are detailed in the following subsections.

2.2.1.1. Task Cohesion in Distributed ISD Teams

Task cohesion focuses on team members' shared understanding of and shared commitment to the tasks that need to be completed in a project i.e. the actions that individuals and groups seek to perform based on an agreed plan (Jehn, 1994, 1995; X. Yang, Tong, & Teo, 2015). Literature suggests that task cohesion can help strengthen communication lines between team members, improve the level of task participation, and support collaborative efforts around the accomplishment of a task; in addition, task cohesion can help teams better utilise the resources available to team members while working towards the completion of tasks (cf. X. Yang, Tong, & Teo, 2015). However, achieving task cohesion requires team members to bridge differences in positions, interests, and cultural meanings through a dialogical approach and align their utilisation of resources around the achievement of a defined task. Conklin (2005) asserts that shared understanding and shared commitment are dependent on the willingness of individuals in a work group to engage in dialogue around inherent differences in their perspectives, understandings, and intentions. Similarly, Chansler, Swamidass, and Cammann (2003) find that shared understanding of work tasks is a key antecedent of cohesion while Van Vianen and De Dreu (2001) assert that task cohesion is predicated on team members' shared commitment to a task. Shared understanding and shared commitment can be conceptualised as a continuously evolving journey rather than a discrete phenomenon which is either present or not present (Lane, O'Raghallaigh, & Sammon, 2016).

There is widespread agreement in literature that task cohesion is a positive determinant of team performance for distributed ISD project teams (Garrison, Wakefield, Xu, & Kim, 2010; Hummel, Rosenkranz, & Holten, 2016; McAvoy & Butler, 2009; Venkatesh & Windeler, 2012; X. Yang, Tong, & Teo, 2015). Task cohesion can help foster effective collaboration in distributed ISD project teams, and ensure the durability of solutions designed for tackling identified problems (Garrison, Wakefield, Xu, & Kim, 2010; Kayworth & Leidner, 2002). In particular, task cohesion helps mitigate the negative impact of distributed team members' fragmented perspectives, agendas, and understandings of the task which needs to be completed (Carte & Chidambaram, 2004; Chidambaram, Bostrom, & Wynne, 1990; Conklin, 2005).

For instance, Mullen and Cooper's (1994) meta-analysis of studies on cohesion finds a highly significant positive relationship between cohesion and performance (defined in terms of productivity), particularly in smaller groups. Based on these results, the authors suggest that the positive relationship between cohesion and performance is primarily due to high levels of shared commitment rather than the emergence of group pride. Beal et al.'s (2003) meta-analysis of 64 studies on cohesion and performance in groups goes further by showing that there was a stronger correlation between cohesion and performance when performance was defined in terms of behaviour (a group's ability to perform a task) rather than outcome (the result which was delivered), as the latter perspective does not consider the impediments that are outside the groups control e.g. economic conditions. In addition, Beal et al. (2003) found that the correlation between cohesion and performance was stronger when performance was assessed based on measures of efficiency rather than effectiveness.

Chidambaram et al.'s (1990) quantitative analysis of 28 computer supported groups also shows that task cohesion has a positive impact on a team's level of satisfaction with outcomes in computer supported groups, and task focus was found to be a key contributor to a group's maturity level. Mesmer-Magnus and DeChurch's (2009) meta-analysis of 72 independent studies also finds that cohesion is supported by the sharing of information, and this in turn positively impacts shared understanding and team performance. Garrison, Wakefield, Xu, and Kim (2010) reports that there is a significant positive relationship between both task cohesion and individual performance, as well as task cohesion and trust within globally distributed teams. Meanwhile, Hummel, Rosenkranz, and Holten (2016) find that shared understanding is essential to the cohesiveness of team members' interpretations and perspectives within distributed groups. X. Yang, Tong, and Teo (2015) also find that awareness of members' skills and perception of shared governance has a significant impact on task cohesion in Fast-response Spontaneous Virtual Teams, and cohesiveness was positively related to team performance.

However, previous literature also asserts that task cohesion is often very difficult to achieve within distributed ISD teams (Chudoba, Wynn, Lu, & Watson-Manheim, 2005; Garrison, Wakefield, Xu, & Kim, 2010; Powell, Piccoli, & Ives, 2004). For instance, Garrison, Wakefield, Xu, and Kim (2010) find that the inherent diversity of distributed ISD teams can have a negative impact on perceptions of group cohesion, trust, and performance, unless cohesion is actively promoted. In particular, Garrison, Wakefield, Xu, and Kim (2010) point to studies which show that cohesion can be impeded in distributed ISD project teams due to the lack of a shared language among team members at the start of a project, and the absence of social cues when using asynchronous communication channels such as email. These issues of cohesion are confounded as distributed ISD teams are not able to benefit from frequent face-to-face communication and informal interactions. In turn this can further impede knowledge sharing and the emergence of trust in the distributed ISD team (Breu & Hemingway, 2004).

In addition, there is a body of literature which warns against the negative impact of excessive task cohesion. While task cohesion is recognized as an important driver of the performance of ISD teams, very high levels of cohesion can create social pressures which suppress disagreement and the appraisal of alternatives due to an unceasing drive towards consensus (Janis, 1972). For instance, studies conducted by McAvoy and Butler (2009) assert that excessive levels of task cohesion can impede the performance of agile software development project teams. Their findings suggest that very high levels of cohesion in ISD projects may have a negative impact on group decision making when divergent ideas are not allowed to flourish, which in turn can impede the development of innovative IT artefacts (McAvoy, Nagle, & Sammon, 2012; S. Newell, Robertson, Scarbrough, & Swan, 2009; Windeler, Maruping, Robert, & Riemenschneider, 2015).

2.2.1.2. Social Cohesion in Distributed ISD Teams

Social cohesion goes beyond the assignment of tasks and instead focuses on the level of shared understanding and shared commitment between team members in terms of their social relationships (Friedkin, 2004; X. Yang, Tong, & Teo, 2015). Social cohesion is important for ensuring that team members continue to function well in the group and develop a positive relationship with other team members (Barrick, Stewart, Neubert, & Mount, 1998; Van Vianen & De Dreu, 2001). A number of factors have been found to influence social cohesion between team members such as the personality composition of the team i.e. level of conscientiousness, agreeableness, emotional stability, and extraversion (Barrick, Stewart, Neubert, & Mount, 1998; Friedkin, 2004). Literature suggests that the emergence of social cohesion can help facilitate communication between team members, improve balance in the allocation of workload, and enhance conflict resolution (cf. Barrick, Stewart, Neubert, & Mount, 1998). In contrast, the absence of social cohesion can result in tensions between team members and reduce their motivation to self-maintain group conditions.

A number of studies have looked at the relationship between social cohesion and team performance. Barrick, Stewart, Neubert, and Mount (1998) find that the personalities and abilities of team members were key antecedents to social cohesion. In particular, they find that extraversion and emotional stability were associated with higher levels of team viability (i.e. the team's ability to continue working cooperatively) through social cohesion. Extraversion is defined by the authors as where an individual is "sociable, enthusiastic, energetic, and optimistic" about working with other people, while emotional stability is referred to as where individuals are able to remain self-confident and control emotions (i.e. anxiety, paranoia) while working with others (Barrick, Stewart, Neubert, & Mount, 1998, pg. 381). They also assert that social cohesion can lead to the development of positive social interactions among team members which in turn enhances team performance (i.e. productivity). Following up on the study conducted by Barrick, Stewart, Neubert, and Mount (1998), Van Vianen and De Dreu (2001) also identified personality as an antecedent of social cohesion, and similarly find that high mean levels of extraversion and emotional stability contribute positively to social cohesion. The authors also find a significant positive relationship between social cohesion, task cohesion, and team performance, where the relationship between personality composition and team performance were not mediated. Meanwhile, Hirschfeld and Bernerth (2008) find that both mental efficiency (i.e. communication) and physical efficacy (i.e. action) are key to the establishment of social cohesion in newly formed action teams, and this in turn leads to more synergistic processes aimed towards the achievement of a shared team objective.

The inherent diversity of distributed teams can impede social cohesion initially due to perceived differences in team member's attributes such as demographic (gender, age, location), skills (i.e. education, organizational position), or values (e.g. work motivation, individualistic-collectivistic orientation) (Garrison, Wakefield, Xu, & Kim, 2010; Paul, Samarah, Seetharaman, & Mykytyn Jr, 2004). While distributed teams are typically better equipped at driving innovation and creative problem solving, some literature suggests these benefits may be offset by the difficulties faced in trying to capture knowledge, and accommodate differences in cultural values, language, time zones, and work approaches (cf. Chiravuri, Nazareth, & Ramamurthy, 2011; Garrison, Wakefield, Xu, & Kim, 2010; Powell, Piccoli, & Ives, 2004). In contrast, homogenous teams tend to experience higher levels of social cohesion due to shared characteristics (S. K. Horwitz & Horwitz, 2007).

Chiravuri, Nazareth, and Ramamurthy (2011) point to the social difficulties faced in distributed teams due to the geographical boundaries between team members, and inconsistencies between the knowledge of experts from diverse backgrounds. Team members can each come with different mental models about the problem domain which can in turn impede cohesion unless interventions are taken to actively promote shared understanding and shared commitment (Bittner & Leimeister, 2014; Chiravuri, Nazareth, & Ramamurthy, 2011). Moreover, distributed team members typically engage in less face-to-face communication which can weaken social ties between individuals and impede socio-emotional development early on (Powell, Piccoli, & Ives, 2004; Robey, Khoo, & Powers, 2000; Wakefield, Leidner, & Garrison, 2008). In order to overcome this challenge, distributed teams must maintain high levels of social communication using interactive mediums that facilitate the development and maintenance of interpersonal relationships (Sarker & Sahay, 2004). This can allow team members to exchange enough social information over time to develop cohesion (Chidambaram, 1996; Chiravuri, Nazareth, & Ramamurthy, 2011) .

Findings presented by Chidambaram (1996) suggest that while social cohesion is initially inhibited in computer supported groups, strong relational links are eventually created (i.e. a four week period as per the study) which overcome initial constraints. In particular, Chidambaram (1996) finds that the attitudes of group members also become somewhat more positive over time through continued use of computer support i.e. email, group decision support systems. F. M. Horwitz, Bravington, and Silvis (2006) also find that social cohesion is essential to the effectiveness of virtual distributed teams, alongside relationship building, and high levels of cross-cultural communication that is supported by appropriate technologies. Meanwhile Sarker and Sahay's (2004) study of space and time in virtual team environments points towards numerous challenges faced by team members in generating social cohesion. For instance, Sarker and Sahay (2004, pg. 8) assert that distributed teams often experience "limited human connection, ineffective communication, and suspicion arising from the inability to verify the actions of the remote members". In order to deal with these challenges, the authors suggest the use of technologies which enable both synchronous and visual communication. Sarker and Sahay (2004) also recommend the need for communication norms which encourage distributed ISD team members to maintain a continuous virtual presence during the project.

2.2.2. Team Conflict

Team conflict is defined as the extent to which team members diverge in their shared understanding of and shared commitment to a project (Carte & Chidambaram, 2004; Osborn & Paul, 2018; Van den Bossche, Gijselaers, Segers, Woltjer, & Kirschner, 2011). There is widespread consensus in literature that the impact of conflict on team performance varies considerably according to whether conflict is task-based or social in nature (Carte & Chidambaram, 2004; Windeler, Maruping, Robert, & Riemenschneider, 2015). The following subsections discuss the differences between task conflict and social conflict in more detail, both of which have been identified as inherent features of distributed ISD teams (O'Leary & Mortensen, 2010; Windeler, Maruping, Robert, & Riemenschneider, 2015).

2.2.2.1. Task Conflict in Distributed ISD Teams

Task conflict refers to where team members diverge in their shared understanding of and shared commitment to the tasks that need to be completed in a project (De Dreu & Weingart, 2003; Farh, Lee, & Farh, 2010; Windeler, Maruping, Robert, & Riemenschneider, 2015). Task conflict is generally seen as beneficial to team interactions in moderation as it allows individuals to voice underlying divergences between their perspectives and interpretations of tasks (Robey, Smith, & Vijayasarathy, 1993; Van den Bossche, Gijselaers, Segers, Woltjer, & Kirschner, 2011). While team cohesion is recognised as an important determinant of team performance, other literature points towards the potentially negative impact of excessive levels of cohesion among project teams (Chidambaram, Bostrom, & Wynne, 1990; McAvoy & Butler, 2009; McAvoy, Nagle, & Sammon, 2012). Task conflict can help challenge team members’ pre-existing assumptions and dispositions through argumentation and clarification around tasks. In addition, task conflict can also foster creativity where specialists from diverse disciplinary and organizational backgrounds seek to capitalise on divergent knowledge flows and overcome the knowledge gap of any one individual. Manz and Neck (1995) suggest that excessive cohesion can lead to dysfunctional decision-making within self-managing teams, as individuals are less likely to challenge the conflicting interpretations and opinions of others. Similarly, Van den Bossche, Gijselaers, Segers, Woltjer, and Kirschner (2011) find that task conflict enables team members to learn, challenge assumptions, and reach a new mutual understanding of the task environment. This can improve team performance as disagreements in a group work setting can be beneficial for addressing areas of contention.

Jehn (1995) goes further to suggest that the impact of task conflict on performance is contingent on the type of task being undertaken. She points out that while task conflict is positively related to team performance in tasks characterised by complexity or wickedness, it can have a negative impact on team performance on tasks that are not characterised by complexity or wickedness. In particular, task conflict and the expression of divergent knowledge flows can improve team performance in tasks characterised by wickedness (Brown, Harris, & Russell, 2010; Weber & Khademian, 2008). Similarly, Kankanhalli, Tan, and Wei (2006) assert that the relationship between task conflict and team performance in the context of global virtual teams is contingent on the level of task complexity and the approach to conflict resolution. Weber and Khademian (2008) also assert that groups must capitalise on the contribution of diverse knowledge flows in order to address features of ‘wickedness’ and develop appropriate solutions for wicked environments. Interdisciplinary teams can harvest divergent sources of knowledge and overcome the knowledge gap of any one individual by engaging in critical analysis (Brown, Harris, & Russell, 2010; Pee, Kankanhalli, & Kim, 2010). Based on their extensive review of literature on diverse distributed teams, Carte and Chidambaram (2004) propose that collaborative technologies which enable heightened levels of participation can contribute to greater levels of task-based conflict as the introduction of such collaborative technology results in more information sharing and in turn, a greater diversity of viewpoints.

ISD literature also suggests that task conflict is essential to facilitate dialogue around alternative solutions (McAvoy & Butler, 2009; Windeler, Maruping, Robert, & Riemenschneider, 2015). For instance, Robey, Smith, and Vijayasarathy (1993) suggest that task conflict plays a significant role in driving ISD project team performance as it allows individuals to raise concerns and objections around proposals which they disagree with. They suggest that task conflict in turn can lead to higher acceptance rates of an IS solution. Similarly, Puntambekar (2006) suggests that interdisciplinary teams can generate diverse knowledge once they are provided with scope to continuously share, challenge, and integrate knowledge around the object of understanding i.e. an IT solution. However, Bradley, Klotz, Postlethwaite, and Brown (2013) assert that the personality composition of a team (i.e. individuals' openness to experience, and emotional stability) has a moderating effect on the relationship between task conflict and team performance. The authors define openness to experience as where individuals tend to remain open-minded, imaginative, and curious during interactions, while emotional stability is defined as where individuals can remain composed, steady, and self-assured during interactions. Bradley, Klotz, Postlethwaite, and Brown (2013) found that while task conflict has a positive impact on performance in teams with high levels of openness to experience or emotional stability, the findings suggest that it has a negative impact on performance in teams with low levels of openness to experience or emotional stability.

2.2.2.2. Social Conflict in Distributed ISD Teams

Social conflict in contrast is generally seen to have a negative impact on team performance. For instance, literature on social conflict (commonly referred to as relationship conflict) suggests that excessive levels of conflict can impede team performance when it breeds negative feelings and resentment between team members (Carte & Chidambaram, 2004; Montoya-Weiss, Massey, & Song, 2001). In particular, social conflict tends to emerge due to differences in values and norms as well as personality differences between group members (De Wit, Greer, & Jehn, 2012). Social conflict can be detrimental to group performance and it can create divisions in the group, which in turn impede collaboration and communication. While literature suggests that a moderate amount of task conflict is essential to promote divergent knowledge and creativity, studies have shown that social conflict tends to inhibit team performance; consequently, there is an inherent tension between the positive and negative aspects of intragroup conflict (De Wit, Greer, & Jehn, 2012).

For instance, the meta-analysis of studies on task versus social conflict conducted by De Dreu and Weingart (2003) suggests that there is a strong negative correlation between social conflict and team performance (decision quality, product quality, production quantity, and team effectiveness). They also find that task conflict can have a strong negative impact on team performance in instances where there is a strong correlation between social conflict and task conflict. Meanwhile, a follow up meta-analysis of social conflict, task conflict, and team performance by De Wit, Greer, and Jehn (2012) finds that a stable negative relationship between social conflict and group outcomes. Similar to De Dreu and Weingart (2003), the authors find that task conflict had a more positive impact on group performance when the correlation between task and social conflict was weak. However, in contrast, De Wit, Greer, and Jehn (2012) did not find evidence of a strong negative relationship between task conflict and group performance as suggested by De Dreu and Weingart (2003). De Wit, Greer, and Jehn (2012) assert that the relationship between task conflict and group performance may vary across contexts such as top management teams vs. non–top management teams.

Social conflict can arise due to the emergence of diverse subgroups within the distributed ISD team, where a subset of team members develop a sense of unique interdependence from others based on shared attributes (Garrison, Wakefield, Xu, & Kim, 2010; Pflügler, Wiesche, & Krcmar, 2018; Windeler, Maruping, Robert, & Riemenschneider, 2015). While the emergence of subgroups can facilitate communication between individuals who are considered members of the subgroup, it typically reduces the level of cohesion within the team more broadly (Carton & Cummings, 2012). This can in turn lead to conflicting goals as subgroup members often display favouritism towards team members who are perceived to be part of the same subgroup. As a result, social conflict can emerge during team interactions due to deep rooted differences in the values, interests, and goals of subgroups (Bahmani, Semnani-Azad, Sycara, & Lewis, 2018; He, Paul, & Dennis, 2018). For instance, subgroups could emerge in an ISD team due to perceived differences between the disciplinary backgrounds of team members, which in turn leads to hypothetical divisions called ‘faultlines’.

Team members from distributed professional and organizational backgrounds typically come with a multitude of different perspectives, ideas, and knowledge which can make collaboration difficult. For instance, Kankanhalli, Tan, and Wei (2006) find that high levels of cultural diversity typically contribute to social conflict in distributed ISD teams, and the impact of this social conflict on team performance may depend on task interdependence and the approach to conflict resolution (e.g. problem-solving through collaboration, problem-solving through the assertion by some team members and not others, or ignoring the problem). For instance, the authors suggest that social conflict can impede team performance when the level of task interdependence is moderate or high. In addition, Kankanhalli, Tan, and Wei (2006) assert that while problem-solving through assertion may be effective for resolving task conflict, it is less effective for resolving social conflict. Chidambaram, Bostrom, and Wynne (1990) state that while conflict is essential to group development, team performance hinges on the ability of the team to deal with conflict constructively i.e. maintaining a divergence of opinions while still working towards a common goal. Windeler, Maruping, Robert, and Riemenschneider (2015) find that electronic profiles, which present personal similarities between team members, can offer a useful intervention for reducing both social and task conflict in distributed teams. In turn, they find that reducing social and task conflict increases team performance overall.

However, in existing literature on distributed ISD teams, cohesion and conflict are often considered in isolation of each other, with little consideration given to how these two variables relate. For instance, Garrison, Wakefield, Xu, and Kim (2010) study of cohesion, trust, and individual performance in diverse groups does not consider the potential impact of task and social conflict on the performance of such groups. **In addition, few studies provide a clear definition of cohesion and conflict in the context of distributed settings, and fail to differentiate between task and social aspects of cohesion and conflict (cf. X. Yang, Tong, & Teo, 2015).** Nevertheless, the tension between cohesion and conflict presents a considerable challenge for distributed ISD team leaders in particular as they must aim to effectively balance the benefits of both while avoiding negative consequences.

The next section discusses literature on distributed ISD team leadership.

2.2.3. Distributed ISD Team Leadership

The previously discussed bodies of literature suggest an organizational tension between cohesion and conflict in distributed ISD project teams. Distributed ISD team leaders can therefore face the sizable challenge of balancing the opportunities afforded by a divergence of ideas through conflict, while simultaneously building sufficient levels of cohesion among the distributed team (Powell, Piccoli, & Ives, 2004; Zheng, Venters, & Cornford, 2011). For instance, distributed ISD team leaders are typically expected to simultaneously maintain structured plans and decision-making control in order to mitigate collaboration issues (Beranek, Broder, Reinig, Romano Jr, & Sump, 2005), while at the same time empowering staff to improvise and express their creativity during ISD practice (Molnar, Nandhakumar, & Stacey, 2017; Zheng, Venters, & Cornford, 2011). This poses a significant challenge for distributed ISD project team leaders in determining how they can balance both cohesion and conflict during team interactions.

Following Bennis and Townsend (1989), leadership is defined as the ability to influence others to act in a way that achieves set goals. Bennis and Townsend (1989) differentiate leaders from managers based on a set of inherent leadership characteristics which include: (1) taking a long-term rather than short-term perspective of goals; (2) challenging team members to ‘do the right things’ (in terms of the project scope) before they ‘do things right’ (structured project management); and (3) inspiring innovation and originality among the team. While managers tend to focus on questions of ‘how’ (i.e. project planning) and ‘when’ (i.e. timeline) during a project, leaders ask the more difficult questions of ‘what’ (i.e. project scope) and ‘why’ (i.e. rationale for actions) (Bennis & Townsend, 1989). Leaders must continuously aim to challenge the status quo and keep an ‘eye on the horizon’, while still ensuring that the team is able to deliver outcomes efficiently and effectively.

According to Bass (1981) and Denison, Hooijberg, and Quinn (1995), effective leadership therefore rests on the ability of an individual to enact a broad portfolio of behaviours (or leadership styles) in order to ensure that, in the words of Bennis and Townsend (1989), teams both ‘do the right things’ and ‘do things right’. The authors concede however, that analysing styles of leadership may prove challenging for researchers in practice as many leadership styles seem contradictory, such as monitoring to ensure team performance while mentoring to encourage staff learning and development. In particular, both Bass (1981) and Denison, Hooijberg, and Quinn (1995) note that leadership frameworks which only consider bipolar dimensions (an either-or perspective of leadership) may struggle to explain the complex nature of leadership in reality.

Similarly, Mintzberg (1973), Mintzberg and Waters (1985), and Mintzberg, Ahlstrand, and Lampel (1998) point to the complex nature of strategic leadership in organizational practices. For instance, Mintzberg, Ahlstrand, and Lampel (1998) criticise the planning school of thought which emphasises a standardised approach or ‘one best way’ to strategic leadership through formalised planning. In contrast, Mintzberg, Ahlstrand, and Lampel (1998) argue that strategic leadership in reality involves a far more complex social and cognitive process than this school of thought would lead us to believe. They point towards other schools of thought, which assert that effective strategic leadership must go beyond planning alone and utilise intuition, experience and wisdom to determine appropriate responses to situations as they arise. In particular, Mintzberg (1973) asserts that there is no single style of leadership that will be appropriate for all situations, and instead leaders must alternate between a portfolio of leadership styles in order to determine appropriate responses.

In order to investigate team leadership within the context of this dissertation, the dissertation specifically draws on Quinn’s (1988) seminal work: ‘the Competing Values Framework’. Findings from Wakefield, Leidner, and Garrison (2008) showcase the relevancy of Quinn’s (1988) framework to the leadership of distributed ISD project teams. The internal styles of team leadership (e.g. mentor, facilitator, monitor, and coordinator) are outlined in Table 3 and describe how leaders shape team interactions in terms of communication, information management, cohesion, and commitment.

Style	Description
Coordinator	Aims to maintain stability by creating structure in the form of rules and standards, and outlining constraints to ensure that structure is enacted by team members.
Monitor	Aims to maintain stability by checking on performance progress, and ensuring continuity by collecting and distributing information to team members.
Facilitator	Aims to foster flexibility by seeking consensus and negotiating compromise around team members' divergent opinions.
Mentor	Aims to foster flexibility by actively listening to team members' needs and supporting their personal development.

Table 3: Internal Styles of Team Leadership (adapted from Quinn (1988))

Quinn's (1988) framework also describes external styles of leadership (e.g. innovator, broker, producer, and director) which focus on how leaders adapt to the organization's external environment and respond to outside change to produce competitive advantage in the market e.g. external support, resource acquisition, adaptability, and profit / impact. The rationale for specifically focusing on the four internal styles of team leadership in this dissertation is an interest in studying interactions *within* the team, rather than team members interactions with external organizational agents (cf. Alfaro, 2010). The dissertation follows Alfaro (2010) in choosing to focus on "leadership roles that are responsible for managing team members interactions (e.g., the mentor, facilitator, coordinator, and monitor roles)… rather than those leadership roles that put emphasis on the relationship between the team and the external environment (e.g., the innovator, broker, producer, and director roles)".

Quinn's (1988) seminal work provides a model for examining the team leadership styles needed to balance the tension between phenomena such as cohesion and conflict. In particular, Quinn's (1988) framework has previously been adopted by IS scholars to examine leadership in IS projects (Alfaro, 2010; Beranek, Broder, Reinig, Romano Jr, & Sump, 2005; Kayworth & Leidner, 2002;

Shao, Feng, & Hu, 2016; Wakefield, Leidner, & Garrison, 2008). In the context of IS literature, Quinn's (1988) model has been empirically examined in studies by Kayworth and Leidner (2002), Beranek, Broder, Reinig, Romano Jr, and Sump (2005), Wakefield, Leidner, and Garrison (2008), Alfaro (2010), and Shao, Feng, and Hu (2016). For instance, Wakefield, Leidner, and Garrison (2008) adopt Quinn's (1988) model to investigate the relationship between leadership, conflict, and performance in virtual teams. Their findings suggest that the coordinator and monitor style are effective for resolving task conflict, while the facilitator style was effective for mitigating social conflict. However, there was no statistically significant relationship found between the mentor style and any form of conflict. Based on this finding, Wakefield, Leidner, and Garrison (2008) suggest that while mentorship may not reduce conflict between team members, it may still be important to reduce conflict between the leader and members of the team. Shao, Feng, and Hu (2016) also put forward a contingency framework of leadership for the adoption and implementation of a system, based on the leadership theories of Quinn (1988) and Bass (1985). While the scope of their study does not consider the system development stage, the findings nevertheless provide insights into leadership in an IS context. Results from their study suggest that transformational leadership in the form of mentorship and facilitation are needed during the system adoption phase, while transactional leadership in the form of monitoring and coordination are needed during the implementation phase. A mix of these leadership styles are also needed during assimilation and extention phases.

More recently, other authors have modified the Competing Values Framework and sought to pursue additional directions of research in relation to Quinn's (1988) model. Hooijberg, Bullis, and Hunt (1999) assert that different leadership styles included in Quinn's (1988) model should be emphasised based on particular contingencies that occur in the organizational context. Meanwhile, Vilkinas and Cartan (2001, 2006) put forward an additional leadership style called the 'integrator' which seeks to examines contingencies in the environment in order to determine which leadership style to apply to a certain situation. The integrator style is an overarching style considers how leaders develop and learn by critically examining the effectiveness of their behaviour.

Quinn’s (1988) model has been subject to some criticism also; for instance, based on an empirical study involving 252 managers, Hooijberg and Choi (2000) assert that in total there may be 6 styles rather than 8, as the coordinator, producer, and director styles can be combined under the role of ‘goal achievement’. Hartnell, Ou, and Kinicki’s (2011) study on the relationship between organizational culture and organizational effectiveness found mixed support for the nomological value of Quinn’s (1988) model and called into question aspects of the model’s proposed internal structure. In response to such criticisms Cameron, Quinn, DeGraff, and Thakor (2014) discuss some of the limitations associated with Hartnell et al.’s (2011) study such as the measures of culture and a restricted number of indicators for organizational effectiveness. However, regardless of the number of styles included and the relative positions of each leadership style, empirical findings in existing literature provide broad support for Quinn’s (1988) model (Belasen & Frank, 2008; Cameron, Quinn, DeGraff, & Thakor, 2014).

Overall, Quinn’s (1988) model seeks to explain how leaders can address organizational paradoxes and drive high levels of performance by simultaneously enacting different styles of leadership to achieve what Quinn (1988) refers to as ‘mastery’ in leadership. Mastery in leadership requires leaders to seek a balance between the need for both stability (i.e. planning) and flexibility (i.e. improvisation) (Quinn, 1988; Ramesh, Mohan, & Cao, 2012). The leader must develop a conscious plan based on important cues and sets of values; however, they must also readjust their plan where appropriate, based on emerging cues and the competing values of other group members (Quinn, 1988).

However, Quinn (1988) and IS scholars such as Kayworth and Leidner (2002), Beranek, Broder, Reinig, Romano Jr, and Sump (2005), Wakefield, Leidner, and Garrison (2008), Alfaro (2010), and Shao, Feng, and Hu (2016) do not consider the importance of constructive conflict for team performance. **Therefore, it remains unexplored whether these styles are sufficient to balance both cohesion and conflict.** While Quinn, Bright, Faerman, Thompson, and McGrath (2014) have more recently discussed constructive conflict in the context of the Competing Values Framework, the model has not been adapted to take this into account and instead the original model only considers the need for leaders to mitigate conflict and promote cohesion. **In addition, the relationship between cohesion, conflict and distributed ISD team leadership in complex environments has yet to be fully explored.** While literature is clear that effective leadership requires individuals to embrace rather than oppose organizational tensions such as cohesion and conflict, **further research is needed to better understand the practical and theoretical implications of this area**.

2.3. Conclusion

Chapter 2 presented a literature review of key concepts in this dissertation. Specifically, the literature review provided an overview of current findings in the IS field as relevant to the research objective and research questions, and identified opportunities for future research. For instance, the literature review centred on two overarching themes: (i) fundamentals of Information Systems Development (ISD), and (ii) understanding distributed ISD team interactions.

<u>Section 2.1.</u> begun by describing foundational knowledge of the research context by reviewing existing literature on ISD practice, ISD projects as a specific instantiation of ISD practice, distributed ISD project teams vs. co-located teams, and 'wickedness' in distributed ISD projects. In particular, literature on 'wickedness' was reviewed to provide insights into environments which are characterised by high levels of socio-technical change and irreconcilable differences between individuals and groups. Section 2.1 also turns attention to

ISD project team performance, looking at subjective and objective perspectives of team performance, and the balanced IS scorecard.

Section 2.2. then reviewed literature on cohesion and conflict in distributed ISD team interactions, with a particular focus on the task and social dimensions of both. The review of literature provided insights into the potentially constructive and destructive nature of cohesion and conflict and how it can potentially impact ISD team performance. Finally, literature on ISD team leadership was also reviewed to provide further insights into team interactions in distributed ISD projects based on a review of the works of Quinn (1988) and associated authors in the IS field.

While existing literature provides useful insights into these different concepts in isolation, opportunities are present to logically explore the relationship between the concepts in more detail. The next chapter therefore draws on logical propositions from literature to investigate the relationship between existing concepts. This represents the first stage of the theory building approach undertaken in this dissertation, and provides a logical understanding of the relationship between different concepts which are of interest to the research objective and research questions. The resulting conceptual model is then continuously developed through the conduct of empirical research, as detailed in the forthcoming chapters.

3. Theoretical Development

Chapter 3 presents the first stage of the theory building approach undertaken in this dissertation. This initial stage, which is referred to as "theoretical development", builds an initial conceptual model using logical propositions from literature to elucidate the potential relationship between different concepts (Carroll & Swatman, 2000; Eisenhardt, 1989). Theoretical development draws on central concepts from the field of sociology to logically investigate the factors which may affect team interactions in distributed ISD projects. The emerging conceptual model is then continuously developed through the conduct of empirical research. In particular, this theoretical development is empirically examined in Chapters 5-9 to derive new insights into team interactions in distributed ISD projects and evolve the conceptual model further.

In particular, the theoretical development stage draws on existing literature to logically investigate the interdependent relationship between different macro-level and micro-level factors which affect cohesion and conflict, as well as their interplay in distributed ISD project team interactions. Macro-level factors are large-scale social patterns which enable and constrain individual behaviours over time, whereas micro-level factors relate to interactions between individuals and objects in the field of practice (Sarker & Sahay, 2003). Fairhurst, Smith, Banghart, Lewis, Putnam et al. (2016) suggest that researchers must direct increased attention towards the interplay between macro-level and micro-level factors in order to understand how organizational tensions (i.e. cohesion and conflict) emerge, change, and reproduce over time.

However, Sarker and Sahay (2003) and Sarker, Munson, Sarker, and Chakraborty (2009) assert that existing literature on group development in distributed teams **has primarily focused either on the micro-level factors, or macro-level in isolation.** However, the authors assert that such a dualist perspective can limit understanding of how the micro-level shapes the macro-level and vice versa.

Therefore, Sarker and Sahay (2003) recommend that the creation of new theoretical frameworks which conceptualise and empirically examine the interplay between macro- and micro-level factors. In particular, research on the interplay between the macro- and micro level factors aims to understand how team interactions are shaped by both macro-level and micro-level factors over time (i.e. enabling and constraining human action), and how team interactions in turn shape these macro-level and micro-level factors. Studying the interplay between macro- and micro-level is essential to better understand how cohesion and conflict manifest and persist over time.

3.1. Macro-level Factors

The macro-level relates to the environmental context in which individuals take action and tend to persist over time (Latour, 2007). Macro-level factors then refer to social factors which can shape the behaviours of team members by both constraining and enabling the actions of individuals and groups (Sarker & Sahay, 2003). For instance, macro-level factors can affect the level of "dependency, control, and intimacy in the team" which both enables collaboration and constrains how team processes transpire (Sarker & Sahay, 2003, pg. 248). In particular, Pettigrew (1987) describes the macro-level as the structural, cultural, and political context within which leadership occurs and where legitimacy for change is derived. Pettigrew (1987) asserts that the relationship between the team is inherently shaped by macro-level factors and creates the antecedent social conditions for team processes.

3.1.1. Parsons' General Theory of Action Systems

In order to investigate the macro-level, the dissertation draw on insights from American sociologist Talcott Parsons (1937, 1951, 1964) and his General Theory of Action Systems. The General Theory of Action Systems represented Parsons's seminal work which became a cornerstone for sociology in the post-war era.

More recently, IS scholars have also shown the merit of Parsons's General Theory of Action Systems as a lens for understanding IS practices in organizations, such as the use of IS for actualising organizational memory (cf. Stein & Zwass, 1995) or for researching the social and the material in IS practice (cf. Mueller, Renken, & van Den Heuvel, 2016).

Parsons sought to understand and explain interactions between individuals, groups, and subgroups based on the macro-level factors in large scale systems. For instance, Parsons offers highly nuanced insights into the macro-level factors of structure (i.e. positions, roles, rules), identity (i.e. role, collective, and personal interests), and culture (i.e. shared meanings, values, assumptions) which he viewed as interrelated. Macro-level factors were seen as social factors which create order by shaping and constraining the actions of individuals, groups, and subgroups. These macro-level factors manifest across these different social spaces such as in subgroups, groups, and institutions which in turn shape individuals' interactive behaviour. For instance, individuals can belong to a number of different groups and sub-groups within society such as an organization, a local community, or the family.

While Parsons' seminal work is recognised as one of the most influential contributions to modern sociology, it has also received criticism in light of feminist and postmodern perspectives. For instance, Parsons's attempts to explain social order by describing the sexual division of labour among men and women in families led to his works being criticised by many feminist scholars. However, it should be noted that Parsons was also a voice for radical political change, such as the promotion of equal rights for all American citizens in the face of racial segregation (Turner, 1991). Similarly, postmodernists have criticised the work of Parsons based on the interpretation that the Theory of General Actions Systems give precedence to the objectivism of structure over the role of human agency (Elbanna, 2016; Giddens, 1984).

Turner (1991) counters these criticisms with an alternative interpretation which suggests that Parsons actually goes some way towards reconciling the dualism of structure and agency. For instance, Parsons's often overlooked concept of 'voluntarism' actually recognises the role of agency in the action of individuals, groups, and subgroups in light of macro-level subsystems such as structure. Similar to the concept of agency, Parsons's notion of voluntarism asserts that individuals have the freedom to decide which goals they wish to pursue, as well as the approaches they will adopt to achieve these goals, once they are within the bounds of social constraints. While Parsons does not fully reconcile the differences between agency and structure, he does open the door to further discussion around the perceived dualism.

This dissertation therefore cautions against an outright rejection of Parsons work based on these somewhat populist denunciations. It is argued that Parsons's work can offer deep insights into the macro-level influences of social action, despite some revisionism which has taken place since his death. While there is general consensus that the General Theory of Action Systems does not represent a grand theory, it nevertheless holds some relevance as it can offer a nuanced view of macro-level factors which influence interactions. The dissertation adopts a different perspective which accepts the criticisms of Parsons's work but aims to complement his legacy and generate new insights.

3.1.1.1. Structure, Identity and Culture

In particular, building on the seminal works of Parsons (1951), the dissertation focuses on three macro-level factors: Structure, Identity, and Culture. These three social factors are interdependent; for instance, the team structure can influence the identity of team members in the ISD project, which in turn shapes the team culture.

Structure deals with the different positions, roles, and rules which shape how individuals take action across different situations (Parsons, 1951). For instance, an individual's course of action during an ISD project could be influenced by the social rules within their profession, their role in an organization, or the decision-making hierarchy of the ISD project team. Structure can take the form of a decision-making hierarchy which sets out which individual will be delegated as the primary decision maker in the team; this in turn acts as an important constraint and enabler of action (cf. Fiol & O'Connor, 2005) as it guides team members around who should make decision and to whom and when they should and should not defer decisions to those in a higher position of seniority. Staples and Webster (2008) asserts that 'structural strength' is a key differentiator between teams as it determines the level of uncertainty or ambiguity present in how a team operates. Teams characterised by weak structures tend to encounter more uncertainties due to ambiguities around how the team will operate and low expectations for reciprocation and reliance; in contrast, individuals in teams with strong structures tend to receive more cues that guide behaviour and their interpretations of the behaviour of others (Jarvenpaa, Shaw, & Staples, 2004). However, teams with strong structures also tend to be less flexible due to issues such as strict top-down hierarchies which can constrain the ability of team members to develop creative responses.

Identity deals with the different interests of team members which motivate their courses of action (Carter & Grover, 2015; Parsons, 1951). Identity is a key feature of the social context and shapes an individual's behaviours, perspectives, and emotions during team processes; for instance, an individual's identity can define how an individual perceives situations and motivates change based on the interests related to an individual's identity (Parsons, 1951; Whitley, Gal, & Kjaergaard, 2014). Identity is central to how individuals derive their 'sense of self' in the world and is said to operate at two broad levels: *individual identity* which emerges from the network of roles and relationships that an individual is embedded in, and *collective identity* which emerges from an individual's membership of a social group such as an organization, department, or project team (Carter & Grover, 2015; Whitley, Gal, & Kjaergaard, 2014). In addition, individual and collective identities are often intertwined with IT artefacts, whereby technology can become central to how individuals express, maintain, and expand their identity (Carter & Grover, 2015; Utesheva, Simpson, & Cecez-

Kecmanovic, 2015; Whitley, Gal, & Kjaergaard, 2014). Carter and Grover (2015) describe how IT solutions such as smartphones are increasingly central to how many people manage their identities as a professional, a parent, or a friend etc. as they allow individuals to remain in continuous contact with work colleagues, their children, friends and express their identity regardless of where they are located. Literature also suggests that identity can inherently shape the development of a IT solution (Bijker, Hughes, Pinch, & Douglas, 1987; Williams & Edge, 1996). For instance, in the context of a distributed ISD project, the design of a system could be shaped by each team member's identity in their profession (i.e. pursuing career ambitions), the project (i.e. improving practices using ICT solutions), and organization (i.e. achieving departmental objectives).

Culture refers to the implicit and explicit assumptions, values, and shared meanings which are internalised by team members over time (Parsons, 1951). Literature differentiates between two primary levels of culture: national and organizational (Leidner & Kayworth, 2006). Research on national culture looks at cultural differences across geographical regions i.e. Hofsted's (1991) taxonomy of national differences in culture across dimensions such as power distance, individualism-collectivism, masculinity-femininity, and uncertainty avoidance. Meanwhile, organizational culture seeks to differentiate between organizations based on their dominant underlying values. This dissertation centres on the latter by investigating culture (assumptions, values, and shared meanings) in the context of distributed ISD project teams. Assumptions centre on the belief systems that guide individuals' behaviour and enable them to make sense of different situations (Leidner & Kayworth, 2006). Cultural assumptions develop over time as individuals encounter problems and develop strategies to address these problems, thus forming the core basis for individual and collective action going forward (Schein, 2010). Values meanwhile influence an individual's judgements based on what is perceived to be important to the group and in turn drive individuals to action by aligning their behaviours with underlying group value judgements which tend to reflect underlying assumptions (Parsons, 1951;

Schein, 2010). Finally, shared meanings can be derived from cultural artefacts such as language, myths, and rituals which also shape the behaviours of individuals and their utilisation of such artefacts (Parsons, 1951; Pettigrew, 1979; Schein, 2010). In an ISD project for instance, the culture of compliance staff might place high symbolic value on regimented documentation on the ISD project, whereas a group of designers may place less symbolic value on documentation compared to programming code (Fitzgerald, Hartnett, & Conboy, 2006).

3.1.2. Macro-level Cohesion and Conflict

Distributed ISD project teams typically involve individuals from numerous organizational, professional, and disciplinary contexts (Kotlarsky & Oshri, 2005; Powell, Piccoli, & Ives, 2004; Sarker & Sahay, 2003). As a result of macro-level differences between team members, distributed ISD team leaders must navigate a labyrinth of roles, hierarchies, and rules (*structure*), professional and organizational interests (*identity*), and values, assumptions, and shared meanings (*culture*). Team cohesion has been identified as a key determinant of team performance in distributed ISD projects as it helps better align the different contextual backgrounds of team members during interactions (Garrison, Wakefield, Xu, & Kim, 2010; McAvoy & Butler, 2009; X. Yang, Tong, & Teo, 2015). For instance, at a macro level, social cohesion is seen as constructive for aligning different cultural values and identities and strengthening the relationship between members of a group; while, task cohesion is seen as constructive for aligning and coordinating the structural roles of team members around the completion of set tasks (He, Paul, & Dennis, 2018; Windeler, Maruping, Robert, & Riemenschneider, 2015).

However, competing literature asserts that excessive levels of cohesion can eventually become destructive where it suppresses the evaluation of alternatives (Janis, 1972; McAvoy & Butler, 2009). Destructive cohesion arises where high levels of cohesion act as a deterrent against independent and critical thinking due to social constraints (Janis, 1972). In light of these issues, conflict is seen as necessary to capitalise on contextual knowledge of specialists from different backgrounds and foster creativity (Farh, Lee, & Farh, 2010). For instance, Kankanhalli, Tan, and Wei (2006) assert that high levels of task conflict in culturally diverse distributed ISD teams can improve team performance, specifically in relation to complex tasks. Similarly, Jehn (1995) suggest that the impact of conflict on performance is also contingent on the type of task being undertaken. She points out that while conflict can have a negative impact on team performance in routine tasks, conflict is positively related to team performance in complex and non-routine tasks. In particular, Jehn (1995) observes that there is a curvilinear relationship between conflict and team performance in non-routine, complex tasks. Findings from a multiple methods study of 105 work groups suggest that: (i) the absence of task conflict can lead to team members becoming complacent about problems and decisions, (ii) moderate levels of task conflict allows team members to critically assess information however, (iii) high level of conflict can overwhelm team members due to high levels of conflicting information and side tracked discussions which make individuals lose sight of the original goal.

3.2. Micro-Level Factors

The micro-level refers to the localised factors that constrain and enable action during team processes (Sarker & Sahay, 2003; Schatzki, 1997). Micro-level factors refer to task related factors which form the foundation of individual team members' behaviours and courses of action in practice; for instance, team members must continuously communicate with each other during the conduct of an ISD project in order to form a future project vision, align their approach to ISD practice, and coordinate resources around tasks (Conklin, 2005; cf. Latour, 2007; Sarker & Sahay, 2003). Micro-level analysis therefore focuses on the study of individuals and groups in their social setting and investigates the task related factors that underlie their communications.

3.2.1. Bourdieu's Theory of Practice

The framework next draws on insights from the French sociologist Pierre Bourdieu's (1977, 1990) Theory of Practice to gain insights into micro-level factors. The Theory of Practice was Bourdieu's magnum opus which was developed during his prolonged ethnographic study of social action among the Kabyle people during the Algerian war (M. Walther, 2014). Bourdieu's work has since been adopted as a theoretical lens in information systems, such as to study knowledge management technology and practice (cf. Schultze & Boland, 2000), and social dynamics in online fields (Levina & Arriaga, 2014). For instance, Schultze and Boland Jr (2000) adopt Bourdieu's Theory of Practice to investigate differences between the practices embedded in knowledge management technology and the situated practices of analysts.

Bourdieu primarily focused on studying the interactions and power dynamics within and between groups in the 'field' of localised practice. Bourdieu was among the first sociologists that attempted to reconcile the dualism between macro-level structure and human agency in social action. While Bourdieu recognised that societies gravitate towards social order, he also argued that courses of action were not solely deterministic and instead actors had freedom to revolt, engage in power relations, and breed social change. Bourdieu argued that macro-level factors were socially constructed and enacted by individuals, groups, and subgroups in the field, which challenged the viewpoint of more objectivist sociologists such as Claude Levi-Strauss. Inspired by the works of Karl Marx, Bourdieu also recognised that there existed class systems which constrained and enabled actors' course of action. However, he asserted that this form of social order was not impenetrable and society could adapt. A central concept in Bourdieu's work is the notion of the 'field' which he defines as the arena where individual actors and groups interact and struggle for power based on the field-specific rules that enable and constrain action (M. Walther, 2014). In conceptualising the field, Bourdieu emphasised the need to directly observe the interactions between individuals, groups, and subgroups within social spaces in order to gain deeper insights.

While Bourdieu's Theory of Practice continues to be lauded, it is also not without its critics. For instance, some feel that Bourdieu's efforts to reconcile the perspectives of subjectivism and objectivism are too vague, and that despite Bourdieu's best intentions, his work relapses into objectivism (King, 2000; Y. Yang, 2014). In particular, some critics have argued that Bourdieu's concept of 'habitus' (i.e. the 'modus operandi' of how individuals take action which is influenced by their tacit knowledge, dispositions, and experience) prioritises structure over agency and therefore does not address the dualism of objectivism and subjectivism. King (2000) counters this argument by asserting that Bourdieu's practical theory does offer a way out of the dualism of objectivism and subjectivism by outlining how macro-level forces are socially agreed through intersubjective interactions rather than defined a priori. While Bourdieu does not describe the concept of identity in detail, and the unique interests which relate to different layers of identity, he does suggest that each field manifests its own forms of interests which actors have agency to pursue.

3.1.2.1. Vision, Approach, and Means

We build on the seminal work of Bourdieu (1977) to identify three related micro-level factors: Vision, Approach, and Means. Each task related factor is interdependent and shapes the other; for instance, the collective team vision can influence what approach is taken to conduct the ISD practice, which in turn shapes what resources or means are required.

Vision is defined as an imagined future reality which guides team member's intended course of action in the field of practice (Bourdieu, 1977; Swanson & Ramiller, 1997). Collective visions around a future reality for the project can arise through continuous dialogue between team members (Roepke, Agarwal, &

Ferratt, 2000; Swanson & Ramiller, 1997). For instance, the collective vision of an ISD project could be to drive organizational change by developing an IT solution that digitalises patient records. Visions help guide team members in planning and making decisions, particularly in situations that may be subject to high levels of uncertainty (Swanson & Ramiller, 1997). This vision in turn guides how team members seize the opportunities afforded by technology to address business problems. In addition, visions can provide team leaders with the legitimation to run initiatives and acquire project resources from within an organization (Bourdieu, 1977; Swanson & Ramiller, 1997). For instance, a well-articulated project vision can enable the team leader to request resources such as staff with the required expertise and equipment.

Approach refers to the method of operation or 'modus operandi' of how individuals conduct practice (Bourdieu, 1977). Bourdieu (1990) asserts that an individual's approach is guided by socially constructed knowledge (both tacit and explicit) which is accumulated over time through an individual's direct experiences. This socially constructed knowledge in turn allows individuals to get a 'feel for the game' and continuously adjust to changes in the field of practice based on perceived opportunities and limitations. An approach shapes how individuals select and generate actions over time across similar scenarios (Bourdieu, 1977; Bourdieu & Wacquant, 1992). For instance, a project approach could be guided by the adoption of the PRINCE2 principles of project management which sets out tightly bound responsibilities for each team member and manages the projects based on a set of stages. Similarly, an agile method could be adopted emphasising an iterative approach to systems development which allows team members to confront constant change by prioritising the processes which add the highest level of value (Fitzgerald, Hartnett, & Conboy, 2006; Russo, Fitzgerald, & Shams, 2013).

Means refers to the resources or forms of capital which are utilised by individuals in order to affect change during team processes (Bourdieu, 1977, 1990). Bourdieu (1990) asserts that action is primarily driven by an individual's utilisation of different means; for instance, an individual's means can be derived from economic capital (i.e. designated project budget), social capital (i.e. network contacts which provide access other resources), education capital (i.e. computer science degree), and recognised achievements (i.e. experience working on previous projects) (cf. Bourdieu, 1990). These forms of capital can assume a varying level of importance depending on the field under investigation. Bourdieu (1990) also argues that each form of capital is closely interlinked and can be converted from one form to another; therefore, the delineations are not absolute.

3.2.2. Micro-Level Cohesion and Conflict

Given the diversity of their backgrounds, distributed ISD team members may come with very different 'world views' which in turn can result in the emergence of numerous competing visions during team processes (Swanson & Ramiller, 1997). ISD project team members may wish to pursue different visions for the system under development which in turn can shape the design of an IT artefact. In addition, Ramesh, Mohan, and Cao (2012) assert that distributed ISD teams face inevitable tensions between a plan-driven approach, where tasks and processes are systematically managed according to a pre-defined plan, and an agile approach which emphasise responsiveness to change in the business environment using short iteration cycles. Based on these challenges, Kayworth and Leidner (2002) point to the need for the leaders of distributed teams to foster cohesion by collaboratively creating a collective vision. Cohesion can also build alignment around the approach and means of the project. At a micro-level, task cohesion refers to individuals' shared understanding of and shared commitment to a vision for the completion of work tasks and division of resources (De Dreu & Weingart, 2003; He, Paul, & Dennis, 2018; X. Yang, Tong, & Teo, 2015). Meanwhile, process cohesion is defined as a sub-dimension of task cohesion and refers to the approach through which a task will be completed (Windeler, Maruping, Robert, & Riemenschneider, 2015).

However, high levels of cohesion may again lead to unintended consequences such as ‘self-censorship’ where individuals are hesitant to air different opinions due to peer pressure in the group to conform (Janis, 1972; McAvoy & Butler, 2009). Other issues that can arise during team interactions include the ‘illusion of unanimity’ where leaders impose the perception that everyone is in agreement around the vision, approach, and means, even if it is not necessarily the case (Janis, 1972). Constructive conflict around tasks is therefore needed to allow team members deal with differences in interpretation through argumentation and clarification (Carte & Chidambaram, 2004; Van den Bossche, Gijselaers, Segers, Woltjer, & Kirschner, 2011). Constructive conflict can facilitate open dialogue around areas of differences in the project and stimulate creativity during team interactions (Farh, Lee, & Farh, 2010). For instance, conflict can act as a disruptive force that leads to changes in the vision, approach, and means. However, leaders must also remain cognisant of the potentially destructive nature of social conflict where disagreements centre less and less on the task and begin to affect the relationship between team members (Carte & Chidambaram, 2004; Montoya-Weiss, Massey, & Song, 2001). Social conflict tends to be more personal in nature and can create resentment between team members if not managed effectively (Robey, Smith, & Vijayasarathy, 1993).

3.3. The Interplay Between Macro- and Micro-Level Factors

Following Latour (2007), the dissertation aims to challenge prior conceptualisations of the social world as something constant and absolute, and instead assert that the social world is constantly in flux based on the continuous interplay between macro-level and micro-level factors. The term interplay refers to the reciprocal relationship between the two dimensions which exist at different levels of analysis. Team interactions may produce patterns which eventually become established as macro-level (contextual) and micro-level (localised) factors. These factors in turn both enable and constrain team members' action providing the 'rules of the game' which guide team interactions (Bourdieu, 1977; Giddens, 1986). Latour (2007) argues that the social cannot be explained by simply labelling a phenomenon as either 'macro' or 'micro', and deep insights can only be reached by studying the interplay between the two levels during team interactions. For instance, team hierarchies cannot be fully explained by the deterministic view of structure, and equal attention must be given to the inner logic of team members who contribute towards the structure's continuity or alteration. As stated by Latour (2007, pg. 170): "Interactions do not really exist because they have to be 'put into' a context, nor that context never really exists because it is always 'instantiated' through individual practice… it might be possible to profit from this endless alternation between polar opposites to learn something about the real topography of the social."

Interestingly, in 'Outline of a Theory of Practice', Bourdieu makes direct reference to the works of Parsons when describing how the perceived dualism between objectivism and subjectivism can be reconciled. He presents the 'habitus' as a bridging concept which links the more objectivist sub-systems of Parsons (i.e. structure, identity, and culture) with more subjectivist perspectives on human agency. In particular, Bourdieu (1977, p. 83) speaks of the habitus as the medium through which macro-level sub-systems are produced and reproduced in the field: "The unifying principle of practices in different domains which objectivist analysis would assign to separate "sub-systems" is nothing other than the habitus, the locus of practical realization of the "articulation" of fields which objectivism (from Parsons to the structuralist readers of Marx) lays out side by side". Bourdieu (1977, pp. 83-84) does not deny that Parsons's subsystems "are objectivities irreducible to their manifestation in the habitus" but emphasises the need to clearly recognise "the dialectical relationship between the objective structures and the cognitive and motivating structures which they produce and which tend to reproduce them".

Giddens (1984) similarly aims to reconcile objectivist and subjectivist perspectives by emphasising the interrelationship between human agency and overarching macro-level factors in social action. As stated by Giddens (1976, p. 121) "social structures are both constituted by human agency, and yet at the same time are the very medium of this constitution". Akin to Bourdieu, Giddens was also primarily focused on the field of practice and emphasised the possibility of social change and revolt in society. However unlike Bourdieu, Giddens levelled direct criticisms against the structural functionalist perspective of Parsons, and rejected that his theory could explain social action. Based on Giddens's criticisms of Parsons, one could argue that some of the insights provided by Parsons are not compatible with those of Bourdieu. This is an assumption that the dissertation wishes to challenge. While differences between both authors are recognised, the dissertation contends that there are complementary insights which can help address some of the limitations present in the other, as recognised by Bourdieu himself. For instance, Parsons offers a more nuanced view of the macro-level subsystems, whereas Bourdieu provides a clearer reconciliation between structure and agency. However, it is important to clarify that the objective is not to combine the theories of Parsons and Bourdieu, as this could result in unintended ontological inconsistencies. Instead the dissertation seeks to draw on the rich insights provided by both and contribute theoretical development which adds a fresh perspective on the works of these two pioneering scholars.

3.4. Conclusion

Following the overarching research objective, the theoretical development seeks to use logical propositions to study the factors which affect cohesion and conflict in distributed ISD project team interactions and their relationship. In particular, the theoretical development draws on existing literature to logically investigate the interdependent relationship between different macro-level and micro-level factors as well as their interplay. The context of the theoretical development is distributed ISD projects characterised by wickedness i.e. seemingly irreconcilable social differences between groups involved in decision-making processes, where the task and contextual information needed to arrive at a solution is incomplete and always changing.

Cohesion and conflict are investigated within the context of distributed ISD project team interactions by studying the interplay between macro- and micro-level factors. Team cohesion is defined as the extent to which team members possess a shared understanding of and a shared commitment to the project, while team conflict is defined as the extent to which team members diverge in their shared understanding of and shared commitment to the project. The definitions of macro-level and micro-level factors are based on the theoretical framework. Macro-level factors are defined as the contextual forces of Structure, Identity, and Culture which affect team interactions and tend to persist over time while, micro-level factors refer to the localised forces of Vision, Approaches, and Means which affect team interactions regardless of whether they are shared by individuals or not.

Finally, the theoretical development seeks to explore further nuances of team interactions by investigating the relationship between cohesion, conflict, and team leadership. Styles of team leadership are studied within the context of team interactions based on Quinn's (1988) seminal framework of leadership. The internal styles of team leadership (e.g. mentor, facilitator, monitor, and coordinator) are adopted to describe how leaders shape team interactions in terms of cohesion and conflict.

The evolution of the theoretical framework is presented and described in more detail across the forthcoming chapters. Each chapter explains how the theoretical framework evolved over time based on emerging empirical insights from the three in-depth case studies and researcher's increased understanding of the research objective. The approach to theory building adopted by the researcher is also outlined in the next chapter.

Chapter 4: Methodology

4.1. Research Design

This section outlines the paradigm choice, research method, and research strategy behind the study. The chapter begins with a statement of the research objective and associated research questions before proceeding to outline a clear rationale behind the decisions taken around aspects of the research design. For instance, the forthcoming subsections explain the rationale behind each methodological choice with reference to the defined research objective and research questions. In addition, the implications and trade-offs associated with these decisions are discussed by drawing on insights from existing literature to explain what each methodological choice means for the study.

As outlined in chapter 1, the research objective of this dissertation is as follows:

To explore how cohesion and conflict co-exist and co-evolve in distributed ISD project team interactions.

In addition, the following research questions are outlined:

RQ1. What factors affect team interactions in distributed ISD projects?

RQ2. How do these factors interplay with team interactions in distributed ISD projects to affect shared understanding and shared commitment?

RQ3. What is the relationship between cohesion, conflict, and team performance in distributed ISD projects?

RQ4. What is the role of distributed ISD project team leadership in leveraging cohesion and conflict?

In order to ensure consistency between the research objective, research questions, and research design, the researcher reflects on the unique characteristics of the dissertation in order to ensure that all choices around the research design were fit for purpose. In particular, the researcher's decision to study both the macro- and micro-level factors which affect cohesion and conflict had a significant influence on the research design in terms of paradigm choice, research method, and research strategy. For instance, an interpretivist paradigm is chosen to investigate both contextual (macro) and localised (micro) levels of analysis. In line with the research paradigm, a qualitative method is adopted to gain insights into the unique perspectives of individuals (micro-level factors), as well as the social and organizational context in which they are based (macro-level factors), and a multiple case study approach is chosen as it allows the researcher to investigate emerging phenomena in a way that is not divorced from context.

The forthcoming sections explain each of these decisions in more detail.

4.1.1. Paradigm Choice: Interpretivist

According to Kuhn (1963, pg. 10), research paradigms refer to "accepted examples of actual scientific practices – examples which include law, theory, application, and instrumentation together – [that] provide models from which spring particular coherent traditions of scientific research". The choice of research paradigm inherently shapes a study's research design in terms of how a researcher will determine: (i) what phenomena are observed; (ii) the type of research questions that are asked; (iii) how these questions are presented; and (iv) how the results are interpreted (Kuhn, 1963). The research paradigm also shapes how the researcher sees the world as well as the language adopted to describe and explain 'puzzles' in science as well as the tools that will be used to investigate these puzzles (Kuhn, 1963).

A number of different paradigms are considered for guiding this dissertation, including: positivism, critical research, and interpretivism.

<u>The positivist paradigm</u> asserts the existence of an objective reality which can be hypothesised and empirically observed to derive generalisable insights on the

causal relationship between variables (Dobson, 2002; Mingers, 2004; Ritchie, Lewis, Nicholls, & Ormston, 2013). The perceived benefits of the positivist paradigm mainly centre on validity and rigor in the conduction of research, for instance, through using quantitative techniques such as surveys. However, for the purposes of this dissertation, the researcher decided against a positivist paradigm due to specific limitations. For instance, studies following a positivist paradigm are typically stripped of context and highly controlled, therefore downplaying the role of subjective experiences in human behaviour. This is problematic for studying the research objective previously defined. For instance, in relation to the positivist paradigm, Ritchie, Lewis, Nicholls, and Ormston (2013, pg. 8-9) questions "whether the elimination of contextual variables in controlled experimental conditions is an appropriate way to study human behaviour" and "whether emphasis on hypothesis testing neglects the importance of […] alternative understandings".

<u>Critical research</u> meanwhile offers another paradigm for IS research which focuses on "social issues such as freedom, power, social control, and values with respect to the development, use, and impact of information technology" (Myers & Klein, 2011, pg. 17). The paradigm of critical research considers the emancipatory potential of IS research and is typically adopted by IS scholars and practitioners in order to both understand and improve existing practices; this is done by challenging the 'taken-for-granted' assumptions that subjects may have in relation to an organization or IS (Myers & Klein, 2011; Orlikowski & Baroudi, 1991). As a result, it becomes possible for people to change restrictive circumstances (both social and material) in order to overcome inequality inherent in the status quo. Given that this dissertation does not harbour any emancipatory intentions, critical research was however, determined to be an inappropriate paradigm.

In the end, <u>interpretivism</u> is chosen as a research paradigm for the purposes of this dissertation. In particular, interpretivism is chosen as it offers a useful lens for investigating the social aspects of distributed ISD projects (Sarker & Sahay, 2003, 2004); this is a key criteria given the focus of both the research objective and research questions previously defined. The interpretivist paradigm views reality and our knowledge of this reality as a social product; one which cannot be understood unless we study the social actors (including the researcher) who construct and make sense of this reality (Orlikowski & Baroudi, 1991; Ritchie, Lewis, Nicholls, & Ormston, 2013). Interpretivist studies seek to access and understand the intersubjective world of actors through prolonged engagement in the field using methods such as participant observations and interviews to uncover the meanings of individuals and groups (Goldkuhl, 2012; Walsham, 1995). This allows the researcher to collect 'thick' descriptions of the context under investigation based on the first hand observations of, and responses from, subjects (Walsham, 1995).

The interpretivist paradigm sees the social world as rife with sociality, value judgements, and subjective meanings; therefore, the task of the researcher is to understand the complex conceptual structures behind the social world using a theoretical framework to filter data and arrive at a deeper understanding (Goldkuhl, 2012; Sarker & Sahay, 2003; Walsham, 1995). The interpretivist paradigm also recognises the researcher's own subjectivity during data collection and analysis and asserts that the researcher is not an objective reporter (Sarker & Sahay, 2003; Walsham, 1995). Therefore, the researcher must take steps to ensure that their potential biases are mitigated, i.e. triangulating findings from different methods in order to increase the robustness of findings.

The interpretivist research paradigm rose to prominence in the IS field during the 80s and 90s in order to address the perceived limitations of positivism and direct more emphasis towards the subjective reality of individuals (Mingers, 2004). This was motivated in part by the increased attention directed towards the social aspects of IS and the study of individuals' subjective meanings in a social context (Avgerou, 2001; Doherty & King, 2005; Markus, 1983; Pettigrew, 1987). Interpretivism is now recognised as a well-established paradigm within the IS field (Myers & Klein, 2011). For instance, numerous IS scholars such as Shanks

(1997), S. Jones and Hughes (2001), Hitchman (2003), Sarker and Sahay (2004), and Sarker and Sarker (2009) have published studies which adopted interpretivism as a research paradigm.

The interpretivist paradigm is also chosen as an appropriate paradigm for this dissertation as it allows the researcher to investigate both the micro- and macro-level factors which affect cohesion and conflict in distributed ISD project team interactions (Sarker & Sahay, 2003; Walsham, 1995). For instance, Sarker and Sahay (2003) adopt the interpretivist paradigm to conduct a case study of both macro- and micro-level aspects of group development in virtual teams. The interpretivist paradigm allowed the authors to gain insights into team interactions that occurred during the course of project work by drawing on the subjective meanings of the social actors involved (Sarker & Sahay, 2003, 2004).

Walsham (1995) also asserts that interpretivism can provide a paradigm for examining the interplay between macro- and micro-level factors in IS research through interpretive understanding. Walsham (1995) calls for more interpretivist studies which examine both the macro- and micro-level using theoretical frameworks to help derive insights at both levels. Therefore, another justification for choosing interpretivism as a research paradigm is that it enables the researcher to place equal emphasis on both structure ***and*** agency during the conduct of research. This is important for investigating the previously stated research objective and research questions which aim to investigate how the interplay between both macro-level factors (i.e. structure) and micro-level factors (i.e. agency) affect team interactions.

4.1.2. Research Method: Qualitative Method

Qualitative research is selected as the most suitable approach to study the research objective and research questions as it allows the researcher to gain in-depth insights into the unique perspectives of individuals (micro-level factors), as well as the social and organizational context in which they are based (macro-level factors) (B. Kaplan & Maxwell, 2005; Ritchie, Lewis, Nicholls, & Ormston, 2013). Therefore, in the present study, qualitative research is used to support 'thick descriptions' of events in a way that is not divorced from the natural setting in which the events take place (Miles & Huberman, 1994; Myers, 2013). For instance, the adoption of a qualitative method in this dissertation enables the researcher to gain a rich understanding of the research context and how people view the world, which would otherwise be difficult to capture using quantitative research alone (B. Kaplan & Maxwell, 2005).

Qualitative research also allows the researcher to iteratively analyse data in tandem with data collection through inductive reasoning. In contrast to the hypothetico-deductive model of quantitative research, the more iterative approach of qualitative research supported the researcher in continuously testing and refining an understanding of the phenomenon of interest until a valid interpretation is reached (B. Kaplan & Maxwell, 2005). For instance, the qualitative research method enables the researcher to evolve his understanding of the phenomenon over time through increased exposure to the research context. This also allows the researcher to modify the approach and adapt the theoretical framework as new insights became available.

However, the inductive model of qualitative research is often criticised by those in the hard sciences for lacking validity and rigor (Bendassolli, 2013). For instance, qualitative researchers are often questioned on how they moved from singular observations to general theoretical statements and how they can justify the knowledge produced. However, in this dissertation, the researcher decided against hypothesis testing as the inherent complexity and uniqueness of the context being studied means that definition of upfront hypotheses would not be possible. Nevertheless, hypotheses can still be developed from the conduction of qualitative research based on insights around the context and research subjects (B. Kaplan & Maxwell, 2005). This in turn can enable the development of theories of more pragmatic value (Bendassolli, 2013).

Another limitation of qualitative research is that the generalisability of findings to other contexts may be less clear than quantitative research. Some argue that qualitative studies do not pursue the goal of generalisability (Mayring, 2007). Similarly, Miles and Huberman (1994, pg. 26) downplay the role of generalisability in qualitative research and asserts that the focus is more on "the conditions under which the construct or theory operates" within a complex and multifaceted context. However, Mayring (2007) maintains that generalisation is still important in qualitative research but requires the researcher to clarify the aim of the dissertation, and their anticipated results. Following Eisenhardt (1989), this dissertation undertakes a cross-case analysis and discusses the findings in relation to existing literature to help increase the generalisability of the theory while still recognising the limits of generalisability.

4.1.3. Research Strategy: Multiple In-depth Case Studies

A multiple in-depth case study approach is selected as the most appropriate research strategy for investigating the defined research objective and research questions given its focus on real-life ISD context where the boundaries between phenomena are not clearly evident (Wynekoop & Russo, 1997; Yin, 1994). Multiple case study research investigates phenomena across similar or dissimilar contexts in order to clarify whether findings are idiosyncratic to a single case or consistent across several cases (Eisenhardt, 1989; Yin, 1994). Multiple case study research also allows the researcher to triangulate different sources of empirical evidence to increase the robustness of findings and supports an in-depth investigation of the phenomena of cohesion and conflict. In particular, the multiple case study approach in this dissertation offers the researcher a useful strategy to build theory through exploratory research across numerous cases. In particular, the ability of the researcher to collect empirical data from different cases helps strengthen the validity of findings which in turn supported the development of robust theories (Darke, Shanks, & Broadbent, 1998; Eisenhardt, 1989). Case study enquiry was also further strengthened by the development of theoretical propositions to guide data collection (Eisenhardt, 1989; Yin, 1994). These theoretical propositions were developed through an examination of existing literature from the fields of sociology and information systems.

One of the primary advantages of case study research to this dissertation is that it enables the researcher to elicit detailed accounts of individuals' actions, experiences, and perspectives in their natural setting (Cavaye, 1996; Yin, 1994). In particular, case study research is useful for the present study given its applicability to environments in which there are contested meanings, and the study of non-linear, fragmented, and multi-dimensional phenomena such as cohesion and conflict (B. Kaplan & Maxwell, 2005). Case study research provides the researcher with in-depth insights into the actions of individuals in a way that is not divorced from the context under investigation. As stated by B. Kaplan and Maxwell (2005, p. 30) in their paper on qualitative research methods for evaluating information systems, the main goal of qualitative approaches such as case studies "is understanding issues or particular situations by investigating the perspectives and behaviour of the people in these situations and the context within which they act". This helped the researcher understand the influence of social, organizational, and cultural contexts on the phenomenon of interest.

Another advantage of case study research to the present study is that it allowed the researcher to explore the emergence of cohesion and conflict over time (B. Kaplan & Maxwell, 2005). This advantage is very relevant to the study of the research objective and research questions as the relationship between people, technology and processes is in constant flux. Case study research enables the researcher to document how individuals' behaviour, experiences, and perceptions change over time, beyond a static point-in-time snapshot. In addition, case study research is well suited to investigating how the causal processes of cohesion and conflict came about, which would not be possible through the use of discrete variables for studying whether causal processes exist (B. Kaplan & Maxwell, 2005; Yin, 1994).

A multiple case study approach also allows the researcher to react and adapt to empirical findings as they arise and pursue interesting lines of enquiry across cases. This flexibility enables the researcher to discover new additional findings that were not anticipated at the start of the process, which would have been more challenging with quantitative methods such as surveys. This is another important strength for studying contexts, which are subject to change, and also allows for the research to grow in maturity as the researcher's understanding deepens. An iterative approach can be taken to data collection in order to formulate more detailed conceptual models.

The next section presents a rationale for the selection of each case study in the sample.

4.2. Research Process

4.2.1. Case Sampling

A purposeful, opportunistic sampling strategy is chosen to select information-rich cases of distributed ISD projects (Patton, 1990). This sampling strategy allows the researcher to take advantage of the opportunities presented to him while working across different research centres in a national University. In particular, new leads gained during the conduct of research are used to identify the concentrated sample of three in-depth case studies (cf. Patton, 1990). Permission to conduct the case study research is granted through an identified 'gatekeeper' in each distributed ISD project, such as the Principal Investigator (cf. Devers & Frankel, 2000). The researcher's initial discussions with identified gatekeepers also generates prima facia evidence on the characteristics of each case, which in turn helps the researcher to determine if the case selection is consistent with the sampling strategy. A summary of the shared characteristics of each case is presented in Table 4.

Feature	Characteristics
ISD Project	Each project sought to develop a novel IT solution which would be launched in a live organizational setting at the end of the project.
Distributed Team	Each project consisted of team members from different organizational and disciplinary backgrounds who were distributed across geographical locations.
Multiple Stakeholders	Each project was co-funded by cash and benefit in kind (BIK) contributions from industry and public funding bodies.
Academia-industry Collaboration	The consortium of each project consisted of a research centre based in a national university, and one or more industry partners.

Table 4: Shared Characteristics of Cases

In addition, a retrospective analysis of the cases also points towards additional shared characteristics across the three projects, including:

- *Complexity:* Project environments are characterised by complexity in the form of interconnected and related practices, and ill-structured organizational boundaries.
- *Contention:* Team members come from diverse multi-disciplinary and organizational backgrounds which created differences between their positions, interests, and values.
- *Uncertainty:* All projects are without precedent in their respective organizations and few exemplars are available to guide how ISD practice should be conducted.

Our unit of analysis is the field of practice (i.e. the ISD project) which is defined as the situated, temporal, and dynamic nexus of action in the social world where individuals, groups, and subgroups, and technological objects continuously interact (Bourdieu, 1977; Nicolini, 2012; Schatzki, 1997; M. Walther, 2014). The unit of observation is team interactions between individuals and subgroups within the field of practice. Specifically, the dissertation investigates team interactions that allow team members to reach or break shared understanding and shared commitment through ongoing knowledge exchange. This unit of observation allows us gain insights into the enactment of distributed ISD practice by studying the interactions between the team members involved and the tension between cohesion and conflict. Based on this embedded unit of observation, the sample size for interviews is therefore confined to team members who are directly involved in the conduction of the practice, rather than the wider group of external stakeholders in the project.

The case study research is sequential and evolutionary, rather than repetitive. The analytical path of each case is summarised as follows:

- Case 1, the Connected Health Platform (CHP) project seeks to build theory through engagement in the field.
- Case 2, the Athena project supports replication logic of the theoretical lens in order to refine or extend theory, and increase the robustness of the framework.
- Case 3, the Clinical Decision Support System (CDSS) project supports further replication logic of the theoretical lens, as well as the exploration and conceptualisation of the constructs outlined in Chapter 3.

4.2.2. Description of Case Studies

This section provides a description of the three in-depth case studies which were undertaken as part of this dissertation: The Connected Health Platform Project, The Athena Project, and The Clinical Decision Support System Project.

The Connected Health Platform (CHP) Project was a collaborative effort between an Information Systems (IS) research centre, a local hospital, a large global technology company, a local start-up, and a national health insurer. The project was to have two primary outputs. First, a connected health platform to remotely monitor expectant mothers' wellbeing across settings. This platform was to integrate a number of ICT solutions including an Electronic Health Record (EHR), smartphone app, a blood pressure monitor, and a urine analyser. Second, a research study was to be conducted involving expectant mothers, with the deployed platform used to record their symptoms, blood pressure, and urine readings. Two subgroups were identified within the distributed ISD project team based on interviews with team members: (i) the 'clinician subgroup' consisting of a clinical researcher, clinical lead, research nurse working in the local hospital, and (ii) the 'IS subgroup' consisting of two developers, a project manager, analyst, and Principal Investigator working in the IS research centre, as well as a data architect working for the global IT company. Members of the start-up and health insurance company did not form part of a subgroup given their limited level of engagement in the execution of the project. The team was distributed across five locations: a research centre on university main campus, a maternity hospital, the national headquarters of the global IT company, and two separate business parks where the start-up and insurance company held offices. The project team utilized ICT solutions such as email, conference calls, project tracking software and a code library. Face-to-face meetings were also organised intermittently, subject to the availability of team members.

The Athena Project was a collaborative effort between an insurance company and a financial technology (FinTech) research centre based within a national university. The project task and remit of the funding scheme sought to develop "mutually beneficial" outcomes for both partners. This included the development of IT solutions which would allow the insurance company to remotely deliver technology-enabled services in a foreign market. In addition, the FinTech research centre was expected to publish research findings in leading academic journals and conferences. Two subgroups were identified within the distributed ISD project team based on interviews with team members: (i) the 'industry subgroup' which consisted of an actuary, innovation lead, and project manager in the insurance company, and (ii) 'FinTech subgroup' which consisted of a Principal Investigator (PI), co-PI, User Experience (UX) developer, and three analysts in the FinTech research centre. The project team was distributed across different geographic locations and organizational settings; team members utilised ICT solutions such as email, conference calls, and file sharing platforms to collaborate, share knowledge, and communicate during the duration of the project. The team were distributed across three locations, a research centre, university campus, and a business park. ICT solutions were utilised by the project team to collaborate; this included the use of email, conference calls, and knowledge management repositories. A face-to-face meeting was also organised on a fortnightly basis.

Clinical Decision Support System (CDSS) Project was a collaboration involving a distributed team of individuals working for a national university, an off-site university research centre, and the Intensive Care Unit (ICU) ward of a public hospital. The CDSS project had two main objectives: the development of software to support decision making in the ICU ward, and the conduction of a research study to evaluate the impact of this solution for improving patient outcomes. Two subgroups were identified within the distributed ISD project team based on interviews with team members: (i) the 'ICU subgroup' consisting of a ICU dietician, clinical lead, pharmacist, and (ii) the 'R&D subgroup' consisting of the developer, postdoctoral researcher, Principal Investigator (PI), research officer, and research nutritionist. The ISD project team was distributed across three distinct locations: a public hospital, the main campus of a university, and a research centre located off-site in a satellite campus. In order to collaborate, the project team utilized ICT solutions such as email, conference calls, and an online knowledge repository. Face-to-face meetings were also organised intermittently, subject to the availability of team members and their ability to travel to the research centre.

4.2.3. Cross-case Analysis

A cross-case analysis of the three in-depth case studies (CHP project, Athena project, and CDSS project) is undertaken in order to derive insights into patterns which emerged across cases. This builds on the initial within-case analysis which identifies the unique patterns within each case (Eisenhardt, 1989; Miles & Huberman, 1994). Once the researcher becomes intimately familiar with each in-depth case study in isolation, attention can then turn towards the investigation of patterns across cases (Eisenhardt, 1989). Specifically, the cross-case analysis is used to address the limitations associated with within-case analysis where "premature and even false conclusions" can arise from the information-processing biases of the researcher (Eisenhardt, 1989, pg. 540). Patterns identified from the cross-case analysis are used to ensure that findings are grounded in multiple sources of data, and also compels the researcher to look beyond initial impressions from the within-case analysis (Eisenhardt, 1989; Miles & Huberman, 1994).

Cross-case analysis can deepen the researcher's understanding of the research objective and research questions by comparing and contrasting findings from the different cases. For instance, the cross-case analysis can reveal new concepts and relationships which the researcher did not initially anticipate based on their analysis of literature or within-case analysis (Eisenhardt, 1989). The cross-case analysis also embeds rigor and validity in the findings, increasing the likelihood that all novel and relevant insights from the data are captured. Furthermore, the cross-cases also compels the researcher to reanalyse existing findings in order to make sense of any differences across the three in-depth case studies (Eisenhardt, 1989).

In particular, the cross-case analysis provides 'frame-breaking' insights for theory building. For instance, the cross-case analysis can allow the researcher to investigate whether the emerging theoretical framework holds true in different settings by examining the relevance of each concept to across different case studies. Cross-case analysis helps refine or extend a theory, and re-examine what concepts help describe and explain the findings. To achieve this, the cross-case analysis searches for similarities and differences between the three cases studies in order to determine where the data corroborates or conflicts with previous theoretical insights which emerged from the within case analysis (Eisenhardt, 1989; Miles & Huberman, 1994). This helps sharpen the theory by searching for additional evidence of the potential relationships between concepts.

4.2.4. Data Gathering

Empirical data is gathered using a multi-method approach consisting of three data gathering techniques: participant observations, semi-structured interviews with team members, and document analysis. Data from each case is triangulated from different data collection sources to increase robustness of findings (Yin, 1994). This required the researcher to be present in the field for a specified duration of time in order to collect data. The research protocol used in each case is consistent, and the timeframe of interest included three phases: requirements gathering, design specification, and development. Access to the research setting concludes when theoretical saturation had been reached and the researcher's incremental learning was minimal due to phenomena having previously been observed (Eisenhardt, 1989). Finally, all qualitative data was securely stored in an encrypted laptop based in a locked office on the university main campus. This laptop could only be accessed by the researcher and required two levels of authentication in order to login.

Table 5 outlines the data collected by the researcher during the timeframes of each case.

Research Method	**Data Source**	**Data Collection**
Participant Observations	The researcher attended all weekly project team meetings, as well as ad hoc subgroup meetings, and informal conversations with team members between meetings. The researcher had unrestricted access to the shared office space in each research centre.	Field notes and vignettes
Semi-structured Interviews	23 face-to-face interviews each lasting about one hour with members of each distributed team (see Table 6 for breakdown).	Audio-recorded and transcribed
Project documents	Project documents including project plans, periodic reports, and related diagrams such as the work breakdown structure.	File storage, field notes, and vignettes
Meeting minutes	Formal minutes from meetings between members of the project team, totalling over 40 documents.	File storage, field notes, and vignettes
Email conversations	Email conversations between members of project team and the researcher as well as internal and external stakeholders during the period, totalling over 743 emails.	File storage, field notes, and vignettes
Presentations	PowerPoint presentations used to deliver project knowledge and provide updates on the ISD practice to internal and external stakeholders, totalling over 70 presentations.	File storage, field notes, and vignettes

Table 5. Summary of Research Methods Across Cases

The researcher spent 6 months in the field for CHP project (May 2015 to January 2016), 12 months for Athena Project (September 2013 to October 2014), and 5 months for the CDSS project (November 2016 to March 2017). Participant observations and the researcher's own reflections were recorded in field notes. During the case study research, the researcher was located on-site in the three research centres during the working week. In addition, the researcher attended scheduled project meetings and ad hoc subgroup meetings throughout the week and regularly met with team members to discuss work progress and challenges. This data was complemented by semi-structured interviews conducted with members of the team (see Table 6), with each interview lasting between 45 and 90 minutes. Finally, project documents, meeting minutes, email conversations, and presentations were used to unearth further insights.

Project	Project Role	Organizational Affiliation
CHP Project	Principal Investigator	IS Research Centre
	Project Manager	
	Developer 1	
	Developer 2	
	Funded Investigator	
	Data Architect	Global IT Company
	Clinical Lead	Maternity Hospital
	Clinical Researcher	
	Research Nurse	
	Director	SME Start-up
Athena Project	Principal Investigator (PI)	FinTech Research Centre
	Co-PI	
	Analyst	
	Project Manager	Insurance Company
	Innovation Lead	
CDSS Project	Principal Investigator	University Department
	Post-doctoral Researcher	
	Clinical Lead	ICU Ward
	ICU Dietician	
	Pharmacist	
	Developer (*2 interviews*)	Healthcare Research Centre
	Research Nutritionist	
Total[1]	**23**	

Table 6. Interviews Conducted for each Distributed ISD Project

4.2.4.1. Participant Observations

Participant observation is used as a data gathering technique in which the researcher observes participants in their natural settings and documents these

[1] Each person represents one interview unless otherwise noted.

observations as a set of detailed field notes (Myers, 2013; Ritchie, Lewis, Nicholls, & Ormston, 2013). For instance, field notes include accounts of conversations during meetings, informal interactions in the office, or other relevant activities that involved research subjects. Participant observations allow the researcher to gain rich insights into peoples' actions, and directly observe events as they unfold. Documented field notes thus offer an unobstructed view of reality, beyond what research subjects might report retrospectively in interviews. Field notes also include the researcher's own reflections and thoughts about the event to offer potential explanations around what happened, as used in autoethnographic approach (Ellis, Adams, & Bochner, 2011). While conducting participant observations, the researcher can also choose to ask questions and ask for further clarifications through informal dialogue with research subjects. This helps the researcher to increase his understanding and can ensure that the researcher is not incorrectly recording events based on a misunderstanding of what is happening. Participant observation requires the researcher to be present in the research subject's natural setting for an extended period of time in order to collect insights and write up field notes. In order to do this, the researcher must negotiate access to the live environment for an agreed duration. Given the sensitive nature of this technique, the researcher must take care to respect peoples' privacy and maintain confidentiality in regards to what is recorded and shared (Ellis, Adams, & Bochner, 2011). Anonymization is one way of protecting peoples' identities so long as it is not possible to infer identities, such as in a small project team or SME.

One of the main strength of collecting participant observation is that it can offer rich insights into people's actual behaviour in their natural setting (B. Kaplan & Maxwell, 2005; Ritchie, Lewis, Nicholls, & Ormston, 2013). This can present a raw account of 'real-life situations', beyond what people would disclose using other data gathering techniques (Yin, 1994). The researcher does not intend to control or manipulate the research subjects and their environment, and instead aims to observe normal interactions between research subjects in their natural environment. This can allow the researcher to collect truthful accounts of the research context, in particular where organizational rules limit the ability of research subjects to speak openly in an interview setting. Another advantage of participant observations is that collecting naturally occurring data can help the researcher gain key insights into the context, which would be harder to acquire using other techniques. For instance, interviews are useful for generating data around the research subject's description of the personal and organizational context however, it does not uncover the natural context in the same way that participant observation allows (Ritchie, Lewis, Nicholls, & Ormston, 2013). Participant observations can also help create more complete accounts of the research settings and overcome the fallibility of memory by documenting contemporaneous accounts of events as they happen.

4.2.4.2. Interviews

Interviews are used as a qualitative data gathering technique to allow the researcher (interviewer) to pose a set of questions to the research subject (interviewee) with the aim of generating empirical findings in relation to the research question (Myers, 2013). According to Yin (1994), interviews offer an appropriate data gathering technique for investigating research questions around 'why' and 'how'. The researcher first develops an interview protocol based on the research question to guide the conduction of the interview. This interview protocol is driven by the research question(s) or hypothesis which are to be investigated (Ritchie, Lewis, Nicholls, & Ormston, 2013). The researcher then identifies key team members in the case and contacts these team members to schedule an appointment for the interview. Once the appointment is scheduled at a time that was convenient for the research subject, the interview can then be conducted for an agreed duration face-to-face. The results of this direct engagement are recorded once the interviewee's permission has been received and then later transcribed in the interviewee's own words in the form of an interview transcript by the researcher.

There are four main approaches to conducting interviews: structured interviews, semi-structured interviews, unstructured interviews, and group interviews (B. Kaplan & Maxwell, 2005; Myers & Newman, 2007). Structured interviews are driven by the interviewer's pre-defined questions, and any divergence from this structure is discouraged. Semi-structured interviews are still guided by a set of pre-defined questions, however, the researcher is afforded more flexibility and they can adapt the line of questioning based on the interviewee's responses. Unstructured or open-ended interviews are those in which the researcher has not defined a set of interview questions and the responses are allowed to emerge based on interviewee's own choice. Questions can still be asked to elaborate on anything that isn't clear or if additional information is sought. Finally, group interviews are those in which a number of research subjects are interviewed together as a group, which allows for dynamic interactions among multiple research subjects.

A strength of using interviews as a data gathering technique is that it can provide rich accounts of the research subject's personal experiences in their own words (B. Kaplan & Maxwell, 2005). The interviewer provides prompts using a set of questions, however, the interviewee can equally express themselves spontaneously and recount their own personal account of what took place. This helps the researcher to uncover the individual research subject's thoughts, emotions, and perspectives of the phenomenon of interest. The interviewee's responses are entirely unique to that individual; however, it may still be possible to draw comparisons with other respondents. Another strength of semi-structured and unstructured interviews is that they are particularly useful for exploratory research as they allow the researcher to follow the interviewee's train of thought and open up new lines of enquiry during the conduction of the interview (Myers & Newman, 2007). Personal accounts of the interviewee's experience may point towards new concepts of interest to the dissertation which were not anticipated at the start of the interview process. In contrast, this opportunity is not possible when using surveys to collect data, as the structure of question is more rigid and predefined. The sample interview protocol adopted in this dissertation is presented in Appendix A.

4.2.4.3. Project Documents

Document analysis provides a source of qualitative data and involves the systematic review and evaluation of printed and electronic documents (Bowen, 2009). Similar to interviews, Yin (1994) asserts that document analysis is a particularly valuable data gathering technique for investigating 'why' a phenomenon took place. Documents include emails, published and unpublished reports, and memos that are relevant to the field of interest. The selection of which documents to analyse depends on what phenomenon and context the researcher is investigating. Documents offer a concrete account of the phenomenon of interest once they are judged to be relevant, reliable, and complete (Bowen, 2009). Identifying the author of the document is one means of judging relevance, and reliability, as well as any relevant responses to the content by other research subjects. This is achieved by analysing the metadata associated with each document (i.e. author, last modified by). The completeness of documents is assessed by searching for additional complementary or conflicting sources of information. In addition, reports may go through several drafts before they're marked as complete. Comparing these different versions allows the researcher to gain insights into how events and understanding changes over time.

Document analysis requires the researcher to identify and then read through a sample of relevant documentation in order to draw out findings and uncover insights which are relevant to the research question (Bowen, 2009). For instance, the sample could include a large body of documents limited to a timeframe of interest. The sample may include publically available documentation, as well as documents which are labelled as private and have not been released publically. The researcher must negotiate access to private documents and ensure that no confidential information is released to the public.

One advantage of document analysis is that it allows the researcher to unearth deep meanings in the style and coverage of recorded communication between research subjects (Ritchie, Lewis, Nicholls, & Ormston, 2013; Yin, 1994). In addition, documents can offer an account of how phenomenon came to exist, and provide a more detailed understanding of the research context (Bowen, 2009; Ritchie, Lewis, Nicholls, & Ormston, 2013). The description of historical events and context included in sample documentation can in turn help broaden the researcher's understanding of the research topic and research question. This allows the researcher to study how situations change over time based on periodic reports. Document analysis is also cost-effective and less time consuming than many other techniques (Bowen, 2009). Similar to participant observation, document analysis helps overcome the fallibility of memory by offering a complementary resource to back up other qualitative data sources. In this way, document analysis can then be used in tandem with other data gathering techniques to help structure the research and allow triangulation of findings (Bowen, 2009). For instance, the responses of interviewees could be compared to documented accounts of an event to ensure accuracy. The supplementary information contained in documents can also expand the researcher's knowledge base and validate, or suggest potential changes to the research design based on uncovered findings.

The next section outlines how data analysis is undertaken.

4.2.5. Data Analysis

Within-case analysis is first undertaken in Case 1 to explore, describe, and explain the factors which affect team interactions in distributed ISD projects, as well as their impact on shared understanding and shared commitment. Literal replication logic is then used in Case 2 and 3 to refine or extend the theory, and corroborate findings in order to increase robustness (Eisenhardt, 1989; Yin, 1994). According to Cavaye (1996, p. 237): "Literal replication of a case expects a second case, which is similar to the first in terms of context, to yield similar findings for process and outcome". Similarly, Yin (1994, p. 47) asserts that literal replication logic "predicts similar results" across two or three cases that are similar in terms of context. In addition, literal replication also allows the researcher to refine or extend the theory where necessary (Yin, 1994). Case 2 uses literal replication logic to examine the relationship between cohesion, conflict, and term performance in the carefully selected context (Yin, 1994). Building on the previous cases, case 3 then examines cohesion and conflict within a similar context in order to corroborate findings (Yin, 1994). A cross-case analysis of the three case studies is then undertaken to help increase the perceived robustness of the framework and the validity of its constituent concepts (Eisenhardt, 1989). Data analysis is guided by three techniques: coding, vignettes, and case analysis meetings.

4.2.5.1. Coding

The transcribed interview data is analysed by the researcher using coding (cf. Glaser & Strauss, 1967; Strauss & Corbin, 1990) in order to identify and code variables such as concepts and properties, as well as the relationship between these variables. As part of the data analysis and theory building process, the researcher's perception of variables and relationships, otherwise referred to as theoretical sensitivity, is influenced by a reading of literature, in particular seminal sociology literature, including Parsons (1951) and Bourdieu (1977). Each sentence in the interview database is then repeatedly read by the researcher and then coded.

This analysis technique rests on the researcher's own interpretation of the phenomenon and the context in which it takes place. Furthermore, the researcher seeks to make implicit assumptions and beliefs explicit using the analytical techniques. Firstly, open coding is used to identify concepts related to the phenomenon of interest and their associated properties and dimensions. A code book containing an inventory of codes and their descriptions is maintained to help structure the analysis. A second round of coding is then used to form relationships between codes through inductive and deductive reasoning. Finally, a third round of coding is used to develop a storyline around the research. This round of coding involves systematically relating a core category "to other categories, validating those relationships, and filling in categories that need further refinement and development" (Strauss & Corbin, 1990, p. 116). A sample data coding table from one of the case studies is presented in Appendix B.

4.2.5.2. Vignettes

Participant observation data and project documents are analysed by the researcher using the data analysis technique of vignettes, which provided "a focused description of a series of events taken to be representative, typical, or emblematic in the case" (Miles & Huberman, 1994, pg. 81). This technique allows the researcher to produce, reflect, and learn from data around key moments in the 'everyday life' of the project (Miles & Huberman, 1994). Vignettes are chosen based on their perceived representativeness which was informed by interview findings and field notes. A sample vignette from the CHP project case study is presented in Appendix C.

The vignettes are then subdivided according to 'mini-cases' within each case and limited based on temporal (i.e. project phases and calendar months) and spatial dimensions (i.e. bounded space) (Eisenhardt, 1989; Miles & Huberman, 1994). For instance, vignettes are subdivided according to project phases (i.e. project initiation, design, and development) in order to examine dynamic nature of cohesion and conflict and how it varies over time. This technique helps further structure the analysis of participant observation data using equivalent project phases for all case studies. Each vignette aims to produce a "focused story" that offers "vivid, compelling, and persuasive" analysis of participant observation data based on the researchers' perspective (Miles & Huberman, 1994, pg. 83).

4.2.5.3. Case Analysis Meetings

Face-to-face case analysis meetings are organised with supervisors, and colleagues with experience in the domain of study, in order to “develop coherent constructs to guide later analysis” through the joint analysis of data (Miles & Huberman, 1994, pg. 76). This form of cross-checking helps the researcher to address potential biases when developing inferential generalisations, and elaborating on preliminary descriptions. These meetings typically last between 60 and 90 minutes and begin with the researcher describing and providing explanations on themes emerging from the case. Case analysis meetings either focus on a theme or themes within a single case, or themes across cases.

The researcher invites questions from those present at the meeting and follows up by offering additional clarifications. The researcher then documents any alternative interpretations, explanations, and disagreements during the meeting which were checked against events in the case from qualitative data sources such as participant observations, interviews, and project documents (Miles & Huberman, 1994). Alternative interpretations, explanations, and disagreements that are judged valid are then tested and addressed through the revision of findings, coding schemes, or conduction of additional fieldwork. These opposing views help question assumptions and improve the persuasiveness of arguments and conclusions derived from qualitative data analysis.

4.2.5.4. Expert Analysis Sessions

Expert analysis sessions are also used to validate the research findings with a group of industry practitioners. The intended output from the sessions is for participants to corroborate or challenge findings from the dissertation through emerging dialogue, and reveal potential directions of future research. The expert analysis sessions aim to gain insights into the range of opinions, perceptions, ideas, and feelings that the participants had on the subject matter. This approach is chosen based on the ‘synergistic’ insights that can emerge when group members interact together, contribute their own views and experience on the subject matter, and listen to the contributions from other people (Krueger & Casey, 2014; Ritchie, Lewis, Nicholls, & Ormston, 2013). Such settings allow group members to reflect on their own interpretations based on what other group members say and in turn refine their thinking.

The expert analysis sessions in question took place on the Irish Management Institute (IMI) Main Campus, Sandyford Road, Dublin 16, on Friday 14th, September, 2018 and Wednesday 7th November, 2018. Both sessions lasted over 90 minutes and involved 16 individuals enrolled in IMI programmes. The sessions were semi-structured based on a slide deck created and presented by the researcher. The slide deck also included a set of questions drafted by the researcher to prompt further enquiry. The slide deck presented a high-level overview of the primary findings from the dissertation; however, participants were provided with the flexibility to shape the discussion and change the agenda as required. The researcher's role was to encourage participants to question the findings and engage in open discussion by sharing their subjective experiences of the subject matter.

The next section outlines the approach to theory building.

4.2.6. Theory Building

Theory building is undertaken with the aim of describing and explaining (cf. Gregor, 2002) the team interactions in distributed ISD projects. In particular, the theorising process seeks to pursue questions of *what* and *why* through a continuum of 'approximations' (Weick, 1995; Yin, 1994). These approximations are based on factors which, although not representative of theory in and of themselves, are nonetheless important parts of the theorising process: *references, data, variables, and diagrams* (Sutton & Staw, 1995; Weick, 1995). For instance, the theorising process integrates: (i) *references* to form conceptual arguments and the preliminary conceptual model (as described in Chapter 3), (ii) listing of *variables* and their interconnections (as described in Chapter 3), (iii) *diagrams* to explain underlying logic and relationships (Chapter 5-9), (iv) *data* from case study research to guide the development of theory (Chapter 5-9).

Eisenhardt (1989) asserts that case study research offers researchers a number of distinct advantages for theory building; for instance, Eisenhardt (1989) asserts that case study research enables researchers to undertake a highly iterative approach to theory building in which theory and data are constantly compared. Eisenhardt (1989) also argues that case study research is well suited to examining new areas of research, such as domains in which existing theories struggle to explain new developments and the need for exploratory research is high. This is enabled by the collection of empirical data which is novel, testable, and valid. In particular, Eisenhardt (1989) argues that a multiple case study approach can provide deep insights into a phenomenon of interest across different but related contexts, and offer a firm empirical grounding for the development of a new theory. The evaluation of high quality case study research for theory building then rests on key criteria, such as: (i) grounding theoretical arguments in empirical evidence; (ii) capturing frame breaking insights; and (iii) ensuring parsimony and logical coherence in the theory (Eisenhardt, 1989).

However, Siggelkow (2007) cautions that there are still inherent challenges associated with theory building from case study research which researchers must remain cognisant of. One of the key challenges faced by researchers according to Siggelkow (2007) is ensuring that the emergent theoretical framework does not 'over determine' or over fit the phenomenon of interest. For instance, this challenge can arise where the researcher includes numerous variables which are specific to the case but do not rise above the idiosyncratic nature of the case to provide a clear and parsimonious theory. The researcher must therefore make clear choices on the variables which seem most crucial to the theory and use the case study findings for illustrative purposes to point towards real life instances of the constructs under investigation. Having said that, the theory should still deliver value when it is "free standing" and Siggelkow (2007, pg. 21) argues that "if a reader were only to read the conceptual part of the paper, he or she would be convinced of the internal logic of the conceptual argument".

There are two extreme positions on the amount of conceptual content or structure needed to guide theory building in qualitative research: (i) an *effectiveness approach* (i.e. grounded theory) where the researcher aims to maximise their sensitivity to concepts arising from an analysis of the data by minimising their reliance on predefined concepts and structures; and (ii) an *efficiency approach* where the research utilises predefined concepts and structures in order to focus the research and maximise the benefit of data gathering and analysis within the constraints of time and resources (cf. Carroll & Swatman, 2000). An effectiveness approach places an emphasis on gathering huge samples of data through long durations spent in the field and the use of open coding to identify concepts. Meanwhile, an efficiency approach emphasises the need to refine the scope of the research by detailing a preliminary conceptual framework which is used to provide initial themes. This conceptual framework is then iteratively updated by the researcher over time based on emerging findings.

Authors such as Dey (1993) and Eisenhardt (1989) have criticised the assumptions of a pure effectiveness approach which suggests that researchers can analyse qualitative data completely free from any predefined concepts and structures. For instance, Dey (1993) argues that there is a difference between an 'empty head' devoid of any previous concepts and structure (as proposed by the 'pure effectiveness' approach) and an 'open mind' in which researchers are open to new concepts and structures but recognise how their accumulated knowledge shapes the analysis of qualitative data (as proposed by the 'pure efficiency' approach). Similarly, Strauss and Corbin (1990) highlight the importance of recognising how a researcher's view of the research situation is shaped by previous readings, beliefs, values, and relevant experience in the area, otherwise referred to as their 'theoretical sensitivity'. Rather than assuming that the researcher is completely devoid of any conceptual model, Strauss and Corbin

(1990) assert that a researcher must become conscious of their subjectivity and clearly outline their conceptual model in order to produce high quality research.

The creation of a conceptual framework allows the researcher to explain their understanding of the research area based on their existing knowledge, experiences, and beliefs, which in turn refines the research scope according to a defined set of themes (Carroll & Swatman, 2000; Miles & Huberman, 1994). According to (Miles & Huberman, 1994, pg. 18), conceptual frameworks explain "either graphically or in narrative form, the main things to be studied –the key factors, constructs or variables – and the presumed relationships among them". Conceptual frameworks allow the researcher to be selective and set out which constructs are most important based on a theory-driven approach, thus refining the number of 'intellectual bins' which will be used to analyse events and behaviours (Miles & Huberman, 1994).

However, it should be noted that conceptual frameworks are not static models that remain impervious to change. Instead the iterative nature of qualitative research means that a researcher's conceptual framework can and likely will evolve and change during the research process based on the emergence of insights from the data, new sources of knowledge and experiences. Yet while authors such as Eisenhardt (1989) have previously highlighted the highly iterative nature of theory building in qualitative research, most existing models fail to truly capture the iterative cycle between theory and empirical data. For instance, Eisenhardt's (1989) roadmap for theory building from case study research does not capture the continuous recursion and backtracking undertaken by the researcher during the theory building process as it represents each stage as a sequential step that the researcher must linearly move through over time (cf. Carroll & Swatman, 2000). This limitation suggests that there are opportunities to develop new approaches which capture the iterative, flexible and opportunistic nature of theory building in qualitative research. In addition, Eisenhardt's (1989) linear eight-stage model follows a positivist paradigm, which calls into question the validity of the model where an alternative paradigm is adopted (Carroll &

Swatman, 2000). The next section outlines the structured-case approach as a way to address some of these limitations.

4.2.6.1. The Structured-Case Approach

The structured-case approach aims to capture the highly iterative nature of theory building in case study research by placing an increased emphasis on how a researcher's conceptual framework evolves and changes over time during the conduction of case study research. In particular, the approach outlines an iterative research cycle which consists of "constructing and articulating a preliminary conceptual structure, collecting and analysing data, and reflecting on the outcomes to build knowledge and theory" (Carroll & Swatman, 2000, pg. 236). Carroll and Swatman (2000) assert that the preliminary conceptual framework evolves and is refined over time based on the interplay between four phases in an iterative research cycle:

1) Plan: The plan phase shapes the remaining three phases by setting out the research design (i.e. data collection and analysis) and research paradigm. In addition, the research plan determines the concepts and relationships in the preliminary conceptual framework.
2) Collect Data: The data collection phase is an ongoing activity which occurs simultaneously alongside the data analysis phase. In contrast to quantitative research, the process of gathering qualitative observations and interpretations in case study research continuously overlaps with data analysis activities (i.e. coding and vignettes).
3) Analyse: During the data analysis phase, concepts in the conceptual framework are used as initial codes for analysing data alongside new codes arising from the identification of new themes. Data analysis is also an iterative activity which requires the researchers to continuously read and reread qualitative data transcripts in order to identify patterns in the data, themes, and generate new understandings.

4) <u>Reflect:</u> In the reflection phase, the researcher engages in introspection in order to move beyond mere descriptions of the data by exploring novel patterns, themes, and relationships between concepts. The rigor behind the research is strengthened by inviting other researchers and practitioners to challenge the initial insights derived from the research and using existing literature to enfold and scrutinise the findings.

Figure 6 provides an illustration of the structured-case approach to theory building in qualitative research. The researcher begins with a preliminary conceptual framework which sets out a number of research themes. This conceptual model is then refined and changed based on the cycle of planning, data collection, analysis, and reflection. The result of this cycle is a series of conceptual frameworks which contribute towards the development of a theory. Literature is used throughout to strengthen the conceptual framework and scrutinise emergent knowledge and theory.

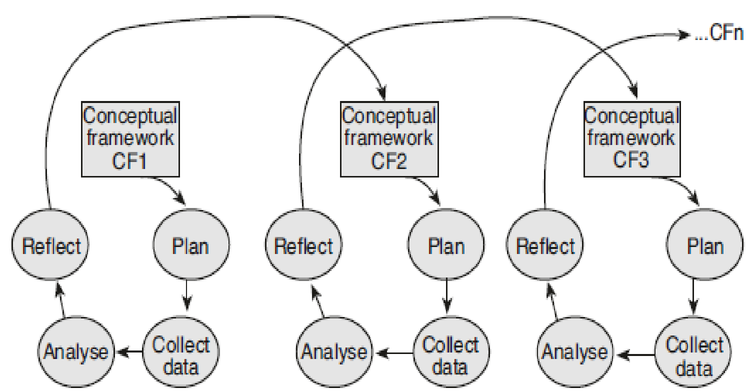

Figure 6: The Structured-case Approach (source: Carroll and Swatman (2000))

In contrast to earlier models of theory building from case study research, the structured-case approach outlines how theory building is achieved through the continuous interplay between the research cycle and evolving conceptual framework. Carroll and Swatman (2000) thus provide insights into how theory building is shaped by an interpretivist research paradigm. For instance, they describe how the conceptual framework guides the research cycle and in turn the conceptual framework is updated based on outputs from the research cycle in order to create a new form of understanding. This interplay continues across numerous iterations of the conceptual framework until the level of incremental learning and refinement reaches a saturation point (Eisenhardt, 1989).

The structured-case approach therefore takes important steps towards demystifying the iterative process of theory building in qualitative research. However, the structured-case approach is not without its limitations. Carroll and Swatman (2000) do not provide guidance on the process of theory building in a multiple case approach and how insights arising from a cross-case analysis can shape the theory building process. In addition, Carroll and Swatman (2000) fail to consider instances where insights derived from empirical data may precede the creation of a preliminary conceptual framework, as they limit their discussion to where the conceptual model always acts as the starting point. Questions around the role of theory in multiple case study research and the indications of theoretical saturation are also outside the scope of their paper. This dissertation aims to address some of these limitations by applying the structured-case approach to multiple case study research.

4.3. Conclusion

Chapter 4 outlined the methodology behind this dissertation in terms of the research design and research process applied to the conduct of primary research and development of theory. The chapter also provided the rationale behind decisions around aspects of the methodology, with reference to the stated research objective and research question. This was done to ensure consistency between the research area, and the means elected to investigate the chosen area. For instance, the researcher gave careful consideration to the unique characteristics of the research and then sought to match these characteristics with paradigms, methods, and strategies which were fit for purpose.

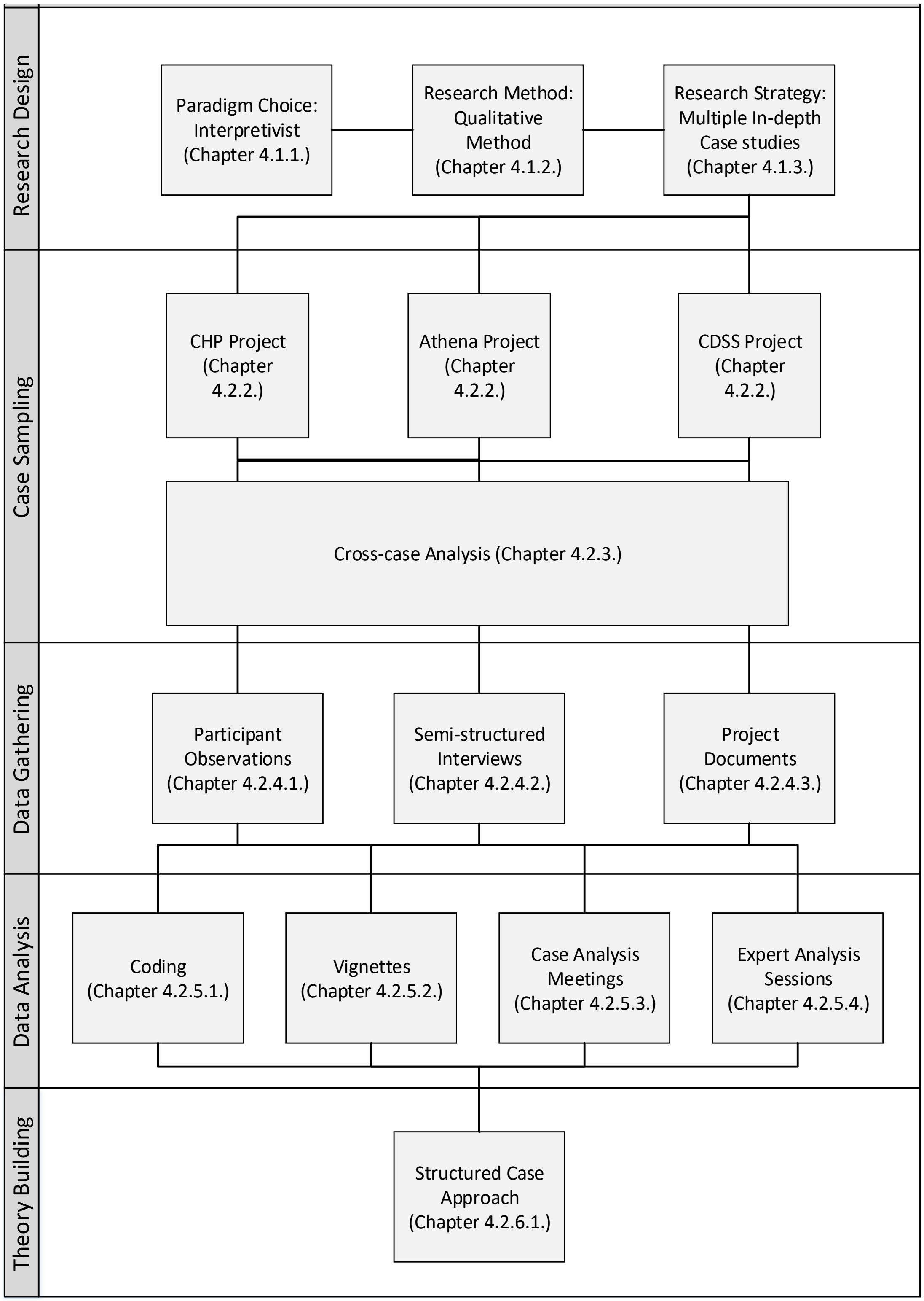

Figure 7: Summary of Methodology

Figure 7 provides a high-level illustration of the methodology at different levels, including the chosen research design, case sampling, data gathering techniques, data analysis techniques, and theory building approach. The diagram also shows the relationship between each aspect and level of the methodology. For instance, the paradigm choice of interpretivism in turn influenced the research method, and research strategy. The research strategy then guided the sampling of three distributed ISD projects: the CHP project, Athena project, and CDSS project. Data from these cases were gathered using three techniques, participant observations, interviews, and project documents, and analysed using coding, vignettes, case analysis meetings, and expert analysis sessions. Finally, a structured case approach was chosen to guide iterative theory building through case study research as it places an increased emphasis on how a researcher's conceptual framework evolves and changes over time.

Part II: The Factors Which Affect Distributed ISD Project Team Interactions

Chapter 5: A Typology for Organizational ICT Practice[2]

Preface to Chapter

This chapter seeks to answer the following research question: *What factors affect team interactions in distributed ISD projects?* In order to answer this question, theory building was undertaken by drawing on preliminary findings from the CHP project, and the seminal works of Parsons (1951) and Bourdieu (1977). The first iteration of the theoretical framework (presented in this chapter) draws on complementary insights from the seminal works of Parsons and Bourdieu to look at how the continuous interplay between macro- and micro-level factors shapes interactions between individual team members and objects in the field of practice. The first iteration of the theoretical framework primarily focuses on presenting linkages between macro- and micro-level factors but does not explore the nature of team interactions in distributed ISD project teams. Nevertheless, the chapter makes an important contribution to the dissertation by outlining the theoretical background of this dissertation.

The paper upon which the chapter is based was submitted to the "Socio-technical Issues in Organizational Information Technologies" mini-track at HICSS. The paper therefore directs attention towards sociomateriality as a lens for conducting IS research. In particular, the paper asserts that sociomateriality should make a much needed return to the seminal literature of Parsons (1951) and Bourdieu (1977) in order to regain some of the richness which is missing from sociomateriality literature more generally and from the discourse on practice in particular. This assertion is founded on preliminary case study findings from the CHP project which also provide illustrative examples to support theory building. However, sociomateriality is not central to the dissertation and is discussed only in relation to the mini-track theme. Instead the primary contribution of the

[2] This chapter is based on a paper published in the proceedings of the 2017 Hawaii International Conference on Systems Science (HICSS-50), Big Island, Hawaii, January 2017.

chapter is the first iteration of the theoretical framework which was informed by the seminal works of Parsons (1951) and Bourdieu (1977).

Abstract

This paper sets out a typology for organizational ICT practice in order to derive a more holistic perspective of sociomateriality and its constituent elements (i.e. humans, objects, and practice). Seminal literature by Parsons and Bourdieu is combined with sociomateriality literature in order to offer insights into the factors that need to be investigated when conducting research into organizational ICT practice. The outlined typology is evaluated through an empirical case study of a connected health ICT project to show how the dimensions of the typology come together and contribute to a better understanding.

5.1. Introduction

Modern organizations are under increasing pressure to adapt to rapid change in the internal and external business environment. Consequently, the problems faced by organizations are becoming progressively more ill-structured and complex in nature, which demands dynamic solutions that are capable of addressing them (Conklin, 2005; Rittel & Webber, 1973). Information Communication Technology (ICT) provides a means of supporting an organization in their quest to remain responsive to volatile internal and external change and maintain their level of competitiveness. For instance, the last decade has seen a significant surge in the level of business investment in ICT initiatives such as Big Data analytics, Decision Support Systems, and the Internet of Things. However, the successful implementation of these ICT solutions in organizational practice is far from a straightforward task and instead requires a holistic approach that considers all elements of the system i.e. humans, objects, and practices.

Sociomateriality claims to provide such a holistic approach by offering insights into "the constitutive entanglement of the social and material in everyday organizational life" (Orlikowski, 2007 p. 1435). The sociomaterial perspective put forward by influential authors such as Orlikowski (2007, 2010) and Leonardi (2010, 2012) posit that the social is inextricably linked with the material, and one cannot be considered without the other.

Sociomateriality helps explain how the social and the material come together in practice within organizations (Orlikowski & Scott, 2008; Suchman, 2005, 2007). However, questions have been raised around some of the central ideas proposed by this 'strong' perspective of sociomateriality (M. Jones, 2014; Kautz & Jensen, 2012, 2013). For instance, calls have been made to reevaluate the perceived ontological myopia of the agential realist perspective of sociomateriality which argues that humans and objects are completely indistinguishable from each other (Faulkner & Runde, 2010, 2013; Kautz & Jensen, 2012, 2013). In addition, as pointed out by M. Jones (2014), many authors have employed the sociomaterial perspective without a full appreciation of all that it entails, which has in turn limited the empirical and theoretical contribution of sociomateriality to these publications. This issue had led to Sutton (2010) criticizing sociomateriality for only adding more academic 'jargon monoxide' and the failure of scholars to provide a clear explanation of its underlying notions (Kautz & Jensen, 2012, 2013).

In this paper, we relook at the area to propose a complementary approach. We advocate a way of relooking at the sociomaterial assemblage of modern organizational practices. We take a conciliatory stance that seeks to balance the power of a human-oriented perspective and an object-oriented perspective in a way that does not promote one above the other. This means viewing the social and material as interdependent.

We then make what we believe is a much needed return to the seminal literature of Parsons (1937, 1951, 1964) and Bourdieu (1977, 1986, 1990) in order to regain some of the richness which is missing from sociomateriality literature more generally and from the discourse on practice in particular. We assert that real life practices are a mosaic of intricate patterns which demand an understanding of the systemic factors of an action system and its underlying subsystems (i.e. social, personality, and cultural), as well as characteristics of localized practice. We combine these insights to create a typology that describes the multifaceted lens that scholars could adopt when analyzing organizational ICT practices.

The theoretical power of this typology is illustrated through descriptions of its application to the healthcare system, and more specifically an empirical case study of a connected health ICT project. The case study is used as an indicative example of the typology's contribution, and derives distinct and valuable findings from empirical data which would be unlikely to emerge from the use of alternative theories. However, this case study is merely one example to show how such a framework may be applied and we feel the principles could be applicable to other organizational ICT practices.

The remainder of this paper is structured as follows: Section 2 provides the theoretical background to our research. Section 3 presents the resultant typology that was developed by the authors. Section 4 presents a discussion based on a case study of a connected health ICT project. Section 5 offers a conclusion.

5.2. Theoretical Background

This section outlines the theoretical background behind our research which draws on theory from the information systems and sociology domains. In particular, our approach is informed by sociomateriality (Faulkner & Runde, 2010, 2013; Leonardi, 2010, 2012; Orlikowski, 2007; Orlikowski & Scott, 2008; Pickering, 1995; Suchman, 2007), the General Theory of Action Systems (Parsons, 1951), and the Theory of Practice (Bourdieu, 1977). The approach uses this literature in order to explore the social, the material, and how the two are combined together in organizational ICT practice.

The rationale behind combining Parsons' General Theory of Action Systems with Bourdieu's Theory of Practice is to generate a richer understanding of the concept of practice that is seen as central to sociomateriality. We first draw on the General Theory of Action Systems to gain insights into the characteristics and motivational categories of social action. Our attention then turns to the Theory of Practice to understand the temporal-spatial manifold of action in practice and how the social and material come together within a social field (Bourdieu, 1990; Schatzki, 1997; Suchman, 2007). We argue that the two frameworks are complementary and help address some of the limitations inherent in each.

There are two main perspectives of sociomateriality categorized by M. Jones (2014): the 'strong' and 'weak' perspective. The difference between the two perspectives is mostly explained in how each interprets the five principle notions of sociomateriality: materiality, inseparability, performativity, relationality, and practices (M. Jones, 2014).

The 'strong' sociomaterial perspective assumes that practice consists of two inextricably linked elements: the social which relates to human actors that interact with each other and pursue objectives, and the material which concerns the non-human objects that materialize through practice (Kautz & Jensen, 2012, 2013; Orlikowski, 2007; Pickering, 1995; Suchman, 2005, 2007). In particular, the strong view of sociomateriality aims to highlight the central importance of materiality in organizational practice, a notion which is often overlooked in organizational studies (M. Jones, 2014; Orlikowski, 2007). According to the agential realist perspective of sociomateriality, the social and material are said to be inseparably linked, and therefore one cannot be considered without the other. In other words, phenomena only come into existence through sociomaterial intra-action in practice, and therefore social and material entities only have inherent properties in relation to, rather than independent of each other (M. Jones, 2014; Kautz & Jensen, 2012; Orlikowski, 2007; Orlikowski & Scott, 2008). The entailments that arise from the social and material are "contingent, dynamic, multiple, and indeterminate", as are the organizational practices that they produce

(Orlikowski, 2007 p. 1445). Furthermore, the relations and boundaries between the social and material are being continuously enacted rather than given, an idea which is otherwise referred to as performativity (M. Jones, 2014).

Meanwhile the ‘weak’ perspective of sociomateriality still recognizes the notions of materiality, inseparability, performativity, relationality, and practices, however a different interpretation is presented (M. Jones, 2014). In this way it qualifies the notions put forward by authors adopting the agential realist perspective, such as Orlikowski (2007), rather than contradicting them. The main points of departure however are that the critical realist perspective would reject that the social and material are inextricably linked, and that the properties of objects are only acquired through their enactment (Faulkner & Runde, 2010, 2013; M. Jones, 2014; Leonardi, 2010, 2012). The critical realist perspective also takes a different view of the stability of sociomaterial entanglements and argues that they tend to become institutionalized in certain circumstances. This still allows for entanglements to radically change through the enactment of practice but assumes that entities can also move towards persistence. Finally, the critical realist perspective disagrees with the agential realist perspective of sociomateriality and its primary focus on the situated instances of action and asserts that social structure persists beyond the present. This allows sociomaterial practices to be studied both in terms of “macro-level stability and micro-level variation” (M. Jones, 2014 p. 919).

The main criticism of the agential realist perspective of sociomateriality is that it doesn’t allow the social and material to be pulled apart, despite the suggestions by other IS scholars that dualism is inherent in the very nature of the sociomaterial assemblage (Kautz & Jensen, 2012, 2013; Mutch, 2013). In this dissertation, we assert the need to deconstruct the sociomaterial assemblage and view the social and material as interdependent rather than inseparable in organizational practices. This allows us to gain more detailed insights into the distinct nature of the social and the material in order to arrive at a more complete understanding of sociomateriality as a whole and practice in particular. In this way, the perspective of sociomateriality that we adopt can be categorized within the critical realist family of thought. We do not deny that the social and material are closely linked; however, we depart from the ontological position of Orlikowski (2007) by deconstructing the social and the material in order to gain insight into their distinct characteristics as well as how they come together in practice (Kautz & Jensen, 2012, 2013).

The next subsection outlines seminal literature by Parsons (1937, 1951, 1964) to provide a framework for examining organizational ICT practice.

5.2.1. General Theory of Action Systems

In order to understand the world of humans and objects it is first necessary to analyze the action systems in which they take part (Parsons, 1937, 1951, 1964, 1971). Parsons' (1951) General Theory of Action Systems provides insights into the characteristics and motivational categories of social action. Parsons takes a holistic view of the systems of actions by recognizing both the motivational significance for individual actors and that of the collective. Social action is said to be guided by three interrelated subsystems: *social system*, *personality system*, and *cultural system*. We will now explain each of these important elements in more detail.

The social system consists of a number of interdependent actors that interact and pursue objectives within given situations that have either a physical or environmental aspect (Parsons, 1937, 1951). The social systems can be analyzed in terms of a 'structural-functionalism' perspective; the structural specifies the elements of a system that can be viewed as constants over a certain ranges of variation in the other elements of the system and the external situation, whereas the functional relates to the issue of mediating between the equilibrium of the system's inherent structure and the changes imposed by the external situation. Normative order is central to social systems and enables social actors to interpret situations based on expectations. The three systems are, therefore, very closely related to one another, and the very existence of a social system depends on the presence of a personality and cultural system.

The personality system refers to the unique identity of each social actor that is interdependent of, rather than constituted by, the role structures to which he/she is ascribed (Parsons, 1951, 1964). The personality system encapsulates the individual's desire for gratification and aversion to deprivation, which thus influences her/his participation in social interaction. Each actor seeks to achieve gratification and avoid deprivation through her/his individual choices of action, as motivated by her/his inherent needs and interests. Needs and interests can be influenced, rather than wholly determined, by the role that an actor assumes. Roles are normatively regulated and involve participation in a structured process of social interaction with role-partners; this assumes that the actor has an obligation for performance in the interaction process. Motivation is also tied to the cultural system as actors can also achieve gratification by taking action that is in line with the dominant set of values. Cultural patterns are therefore maintained through the socialization of the individual whereby societal values are internalized over time in his/her personality system (Parsons, 1951; Schein, 2010).

Finally, the cultural system refers to the complex structure of symbols of expression and meaning, and the conditions of their utilization, maintenance, and change (Parsons, 1951, 1971). These value-orientations and cultural patterns of action which are collectively shared by social actors influence "the motivational aspects of social processes" (Turner, 1991 p. xx). Culture permeates the very heart of every social system, and influences the behavior of constituent actors, whether they are aware of it or not (Parsons, 1951; Schein, 2010). According to Schein (2010), there are three levels of culture: artefacts, espoused values, and basic underlying assumptions. Artefacts are observable products of the social group such as objects and language which are not always easy to decipher. Espoused values are reflected in all group learnings and develop over time when values and beliefs initially put forward by visionaries or leaders in an organization are validated through group experience. Only shared values that have been continuously validated as a reliable means of tackling problems will then develop into basic underlying assumptions. Basic assumptions form a bedrock upon which groups take action, and are rarely substituted. Culture is closely related to the social and personality system and is shaped by “leadership behavior, and a set of structures, routines, rules, and norms that guide and constrain behavior” (Schein, 2010 p. 1).

5.2.1.1. Examples Applied to Healthcare We suggest that any practice ought to be considered in relation to the three systems just described. Table 7 provides an overview of Parsons’ subsystems applied to healthcare.

	Examples for Healthcare
Social System	Within a healthcare setting, human actors such as clinicians, surgeons, pharmacists, lab technicians, and patients, and non-human objects such as a hospital's patient health records, medical devices, medication, test results etc. continuously interact in the pursuit of healthcare quality (Doyle, Lennox, & Bell, 2013; M. Jones, 2014). Both actors and objects are subject to constraints within the social system such as clinical protocol, regulation, standards, and guidelines, but they are also afforded agency in how they achieve objectives. For instance, the National Institute for Health and Care Excellence in the UK has set out clinical guidelines for managing hypertensive disorders of pregnancy; however, clinicians are still permitted to exercise judgement in certain situations where it is in the best interests of the patient (NICE, 2011).
Personality System	Each human actor and non-human object in the healthcare system possesses a unique identity that motivates action. Identity is influenced in part by the role occupied but there can also be idiosyncratic differences between the motivations of actors and objects that are distinct from their role. Rather than being static, this identity is continuously unfolding through the process of social interaction. For example, the identity of a Clinical Decision Support System (CDSS) can vary depending on the context in which it is being used and the associated clinical objectives. A CDSS can be used by surgeons to review a patient's diagnosis prior to an operation; alternatively, a GP can use a CDSS during a health screening to recommend lifestyle changes to the patient.
Cultural System	The cultural system strongly influences how human actors and objects interact in the healthcare system. For instance, clinicians acquire learnings from past clinical decision-making processes which can in turn develop into espoused values, and basic underlying assumptions (Schein, 2010). Objects represent another core level of the cultural system and provide symbols of expression and meaning within the patient pathway. Furthermore, machine learning algorithms in CDSS can provide opportunities for the learnings of connected objects to be captured and stored over time, along with explicit clinical knowledge.

Table 7: Examples of the General Theory of Action Systems

One criticism directed towards Parson's theory is that it fails to adequately explain social change, in particular disruptive social change, and power struggles between actors (Turner, 1991). We assert that this limitation can be adequately addressed using Bourdieu's (1977) Theory of Practice which helps describe how actors compete for power and create social change and provides insights into the underlying nature of practice (i.e. the temporal-spatial manifolds of action) and the underlying power struggles that exist in the social context.

5.2.2. Bourdieu's Theory of Practice

Bourdieu's (1977) Theory of Practice provides a theoretical framework for understanding how human actors pursue objectives within dynamic social contexts. Practice is viewed as the nexus of human activity which means that the social is in a state of constant flux, contingent on how numerous manifolds of actions come together (Schatzki, 1997). According to the perspectives of prominent practice theorists Bourdieu (1977, 1986, 1990) and Giddins (1984), "practices are ontologically more fundamental than actions" and the very being of action is embedded within practice (Schatzki, 1997 p. 284). Bourdieu sees practice as comprised of a collectively negotiated set of actions which is governed by a joining together of individual properties such as objectives, interests, and motivations. Therefore, rather than seeing the organization of practice as separate from the determination of individual actions, Bourdieu and Giddens see both as homologous.

Both Bourdieu (1977) and Giddins (1984) suggest that although actors are subject to underlying continuants in the social context such as social rules, relations, positions (*structure*), they are also afforded some freedom in how they achieve their objectives (*agency*) (Faulkner & Runde, 2010; King, 2000; M. Walther, 2014). Similar to Parsons (1951), Bourdieu (1977) and Giddins (1984) aim to reconcile the structuralist and agency perspectives by asserting that structure and agency are closely linked. For instance, Bourdieu (1977) proposes that while rules within the social field influence an actor's thoughts and enable or constrain certain activities, actors still have the right to choose between alternative options and decide how they utilize capital. Therefore, power struggles are constituted by the interplay of agency and structure, which occurs in the habitus and in turn can generate social change (Navarro, 2006).

Essentially, Bourdieu's (1977) framework consists of three interrelated elements which together constitute practice: *field, habitus,* and *capital*. The following paragraphs describe these three elements in more detail.

The field element refers to the 'arena' in which interactions between actors and objects take place and the practice unfolds (Chudzikowski & Mayrhofer, 2011; M. Walther, 2014). Social fields exist as subdivisions within the broader social space and provide explicit and tacit rules, and shared meaning which are specific to each field (Bourdieu, 1977). A network of actors interact, pursue objectives, and fight for positions of dominance in the social field and develop strategies to maximize their capital within the boundaries of the inherent rules of the social field. The rules that apply are determined by the position that the actor holds in the field and consequently affects what practices can feasibly be undertaken (Bourdieu, 1977).

Habitus is a core element of Bourdieu's (1977) theoretical framework and refers to the "ensemble of schemata of perception, thinking, feeling, evaluating, speaking and acting that structures all expressive, verbal, and practical manifestations and utterances of a person" (Krais, 1993 p. 169). The habitus is socially constructed and affects how actors view themselves, the world around them, and the opportunities and limitations perceived. As a result, the habitus strongly influences how actors select and generate actions across similar scenarios (Bourdieu, 1977; Bourdieu & Wacquant, 1992). However, the habitus is not static and instead it is dynamically shaped by the surrounding context and is subject to change over time (Navarro, 2006). As a result, the habitus allows actors to adapt to unforeseen changes and generate strategies that are aligned with change.

Capital refers to the resources that allow an actor to enter a field and occupy a position relative to other actors within the field and social space. Bourdieu (1977) asserts that there are four interrelated forms of capital: Economic, Cultural, Social and Symbolic (Bourdieu, 1986; Bourdieu & Wacquant, 1992). Each form of capital may be attributed different levels of value depending on the social field under investigation and the rules that are inherent within it. Therefore, one form of capital may be accorded more or less value by actors in the social field. It should also be noted that capital assets are closely interlinked and they can be converted from one form to another. Table 8 describes each form of capital in more detail.

Capital	Description
Economic	An actor's material wealth (i.e. fortune and revenue) which can be converted into monetary assets or institutionalized as property rights.
Cultural	Three types of cultural capital: • Objectivized - cultural capital embodied as transferable material objects that the actor possesses. • Incorporated - an actor's persistent dispositions that were formed from their intellectual qualifications or human capital, and are non-transferable. • Institutionalized – embodied as a certificate of cultural competence from a recognized institution.
Social	An actor's network of social relations which can potentially allow them to access other resources. Social capital can be institutionalized through a conferred title, membership of a group / class, or family.
Symbolic	Internal and external recognition of an actor's achievements. Symbolic capital can also be generated through the conversion of an actor's economic, social and cultural capital when they enter a field.

Table 8: Bourdieu's Forms of Capital After: Bourdieu (1977)

Of particular interest to our research is Bourdieu's notion of a 'cultural object' which he defines as simultaneously being "a socially instituted material object and a particular class of habitus to which it is addressed" (Bourdieu, 1986 p. 91). Bourdieu (1986) asserts the need to analyze both the effect which the designed object was intended to produce based on its form and the habitus on which it is operated. He argues that the habitus and social field largely influences which material objects the actors perceive as valuable in the social field, and thus affect societal power relations (Navarro, 2006). In other words, practice is created through the combination of the social field, the habitus, and an actor's capital (e.g. cultural object).

5.2.2.1. Examples Applied to Healthcare We suggest that any practice ought to be considered in relation to the concepts just described. Table 9 applies Bourdieu's Theory of Practice to healthcare and offers examples.

	Examples for Healthcare
Field	The field of emergency care involves a multitude of actors such as paramedics, nurses, doctors, and administrative staff, as well as numerous objects and other forms of capital (see Capital row below). Each subdivision of the social space has different explicit and tacit rules, and shared meaning. For instance, in emergency care, the prompt delivery of urgent patient treatment is prioritized, whereas in tertiary care the focus is convalescence. In addition, the inherent constraints within each field are different i.e. journey time in emergency care.
Habitus	The habitus enables paramedics to effectively deal with emergency situations by influencing their evaluation of the situation at hand, communication processes, and resulting choice of action i.e. safely moving victims of a car accident from the crash site. In addition, the habitus is not static and can change when necessary which allows paramedics to remain flexible to changing conditions in the emergency site.
Capital	Examples of capital in the emergency care setting include: monetary funds to cover equipment and human resource costs (economic), access to equipment such as a defibrillator, piped oxygen system (cultural), social relations which enable the coordination of care among specialists in the emergency department (social), and recognition of an individual past achievements (symbolic). Capital allowing actors to enter the healthcare field, interact, and compete for power.

Table 9: Examples of Bourdieu's Theory of Practice

The next section introduces a typology for organizational ICT practice that was developed by the authors. The typology was informed by the seminal literature outlined in this section and aims to describe the perspectives that designers could adopt when developing ICT solutions.

5.3. Typology for Organizational ICT Practice

In order to arrive at a typology for organizational ICT practice, the authors sought to combine seminal literature by Parsons and Bourdieu to describe practice (that is central to sociomateriality). The aim is to provide a more holistic lens of practice which considers the perspectives of humans, objects, and practice within organizations. The sociomaterial assemblage is deconstructed into the social, the material and practice and then investigated using the General Theory of Action Systems (Parsons, 1937, 1951, 1964, 1971) and the Theory of Practice (Bourdieu, 1977, 1986; Bourdieu & Wacquant, 1992). This can contribute to a greater understanding of practice more broadly through gaining insights into the individual elements and their interdependencies that make it up.

It should be noted that the linkage proposed by sociomateriality between the social, material, and practice is still maintained within this typology. This is similar to the phenomenon of imbrication as described by Leonardi. Where our perspective of sociomateriality differs is that we assert the need to deconstruct the sociomaterial assemblage and re-conceptualize the social, the material, and practice as interdependent elements. We contend that the resulting theoretical lens can provide a far richer set of empirical findings than would otherwise be possible – a richness that can be lost when the social and material are taken as being inextricably linked.

Table 4 outlines some of the limitations of alternative theories that address the characteristics and motivations of social action, and how the social and material come together in practice. This includes the theories of Socio-Technical Systems (STS), the Social Construction of Technology (SCOT), and Actor Network Theory (ANT). Table 10 and the paragraphs that follow are dedicated to describing how our typology of organizational ICT practice attempts to address the limitations of these alternative theories.

Theory	Description
STS	Asserts that social and technical systems are interdependent and therefore, both systems should be considered in tandem and the relative importance of either should not be presupposed (Mumford, 2006). A limitation of STS is that it does not address the nuances of sociomaterial practice and instead STS primarily focuses on how abstract social constructs and technical infrastructure are recursively shaped (Leonardi, 2012).
SCOT	Explains how social groups shape the construction of technology, and similarly how technology influences social groups (Bijker, 1997). A limitation of SCOT is that it fails to adequately consider the impact of power struggles between social groups; also the SCOT concept of 'stabilization' overlooks the potential for a technology artefact to be continuously reinterpreted during use (Klein & Kleinman, 2002).
ANT	Focuses on how individual actors come together to form networks and how their identities and roles are defined within a network (Callon, 1986; Latour, 2007). A limitation of ANT is that it pays little attention to the role of social structure, politics, power asymmetries, and the challenges of description (i.e. selecting which actors to study) (McLean & Hassard, 2004; Walsham, 1997).

Table 10: **Limitations of Alternative Theories**

The aim of our typology of organizational ICT practice is not to supersede these alternative theories, but rather to provide another way of describing practice that addresses some of the limitations of STS, SCOT, and ANT. Our typology for practice allows researchers to consider in tandem the influence of both the systemic factors of action systems, such as social structure, motivations of social action, and culture, as well as the localized factors of practice, such as the habitus of actors, social change, and power asymmetries. This contributes to a more complete understanding of organizational ICT practice than previously possible with former methods, and also goes some way to addressing Mutch's (2013) criticism of sociomateriality that it directs limited attention towards the notions of broader social structures and power struggles. Furthermore, the typology of organizational ICT practice can support the design of artifacts for improving current systems based on a more thorough account of complex and dynamic environments.

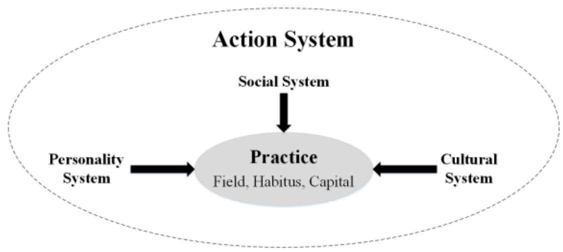

Figure 8: **Conceptual Diagram of the Typology for Organizational ICT Practice (Version 1)**

Figure 8 presents a conceptual diagram of the typology for organizational ICT practice. Firstly, it shows that practice and its inherent elements such as field, habitus, and capital, are situated within the broader action system. Similarly, the diagram shows that practice, defined as a temporal-spatial manifolds of action where the social and material come together, is affected by the three interrelated subsystems of the action system i.e. the social, personality, and cultural system. Therefore, in order to gain a full understanding of practice it is necessary to consider the systems that influence action, independent of any one practice.

Table 11 describes this typology in detail, and highlights its contribution in helping researchers arrive at a more in-depth understanding of sociomateriality. Descriptions in the table are further informed by the works of Faulkner and Runde (2013) and Leonardi (2010, 2012).

The next section outlines a case study of a connected health design project using the typology for organizational ICT practice as a lens for conducting the sociomaterial analysis.

	Field	Habitus	Capital
Social System	In practice, human actors and non-human objects interact and pursue objectives in a social field. They are afforded agency in how objectives are achieved but actors and objects are also subject to the structure of the broader social system and the field (i.e. rules, relations, positions).	The social system influences the habitus and provides the schemata for interactions between human actors and non-human objects. The habitus helps mediate the field's inherent structure with changes in the broader social system, by adapting to change over time.	Prior to entering a field, human actors gain access to capital in the wider social system which allows them to achieve objectives and assume power through practice. Non-human objects also have a social life of their own which can change over time as they are thrown away, and recommissioned in new practices (Faulkner & Runde, 2013).
Personality System	Each human and object has a unique identity, and is driven to action in the field by the motivations of the personality system. These motivations are influenced in part by the role they assume, as well as personal or collective interests.	The habitus forms part of the personality system and molds the identity of humans and objects within practice. The habitus determines how actors select and generate action which is also influenced by the associated motivations of the personality system that drives action.	Capital can also adopt personality systems within practice. For instance, cultural objects have identities conferred upon them by humans, based on their form and function; the personality of objects is also subject to change over time based on its durability (Faulkner & Runde, 2013).
Cultural System	Humans and objects produce, and are consciously or unconsciously influenced in the field by the values, meaning, symbols, and assumptions of the surrounding cultural system. This thus affects how actions are carried out within the social field.	The habitus is an aspect of culture that is enacted in practice and provides a means of expression and shared meaning. The habitus impacts actors perceptions, thinking, evaluation etc. in relation to the levels of culture i.e. artefacts, espoused values, and underlying basic assumptions (Schein, 2010).	The forms of capital that are valued in a field are actively shaped by the surrounding culture. For instance, basic underlying assumptions that have been validated from previous experience influence which objects are perceived as valuable for undertaking practice (Schein, 2010).

Table 11: **Typology for Organizational ICT Practice (Version 1)**

5.4. Discussion: Case Study of a Connected Health ICT Project

This section describes the case study of a connected health ICT project to provide an empirical grounding. This case study offers a relevant and rich context for illustrating the theoretical power of our typology, given the complex and multidisciplinary nature of the connected health ICT project.

The connected health ICT project in question was a collaborative effort involving partners from both academia and industry. A multi-disciplinary team of actors came together within the field of a funded connected health project to develop a home-based antenatal system for monitoring the wellbeing of expectant mothers. The developed system integrated a number of different non-human objects including a mobile app, home blood pressure monitor, urine analyzer, and electronic health record. Meanwhile, the project team consisted of twelve human actors including two Principal Investigators, and team members drawn from different institutions and professions, including obstetrics and gynecology, project management, and information systems.

The observations provided in the paper were collected over a period of six months using a field-based methodology. During this time, the observer became an active member of the multi-disciplinary team working to define the scope and requirements for the connected health platform. Table 12 describes the findings from this case study in more detail, with findings structured using the typology outlined in the previous section. When we examine the case through the typology, we notice some interesting nuances which would be unlikely to emerge from alternative theories.

Firstly, the action system had a considerable impact on how localized practice was enacted in the context of the connected health ICT project. The project was without precedence, and none of the team had prior experience of working on a connected health ICT project. As a result, systemic factors from the action system such as the social structure of each partner organization involved in the project, rules set by the scientific funding body, motivational interests associated with the role of each actor, and espoused values and basic underlying assumptions of different cultures influenced the course of social action. For instance, team members from a clinical background were motivated by a ‘patient first’ approach that focused on the clinical trial, whereas others in the project team were more interested in a ‘technology first’ approach. Team members were also strongly influenced by their surrounding culture; clinicians prioritized the improvement of patient wellbeing and the implementation of clinical guidelines, whereas technicians were more focused on defining system requirements and designing the end solution.

Secondly, factors associated with the localized enactment of practice also had a large impact on the course of social action. Power asymmetries between actors arose from their access to constrained cultural objects such as clinical documentation and medical devices, as well as access to social capital including relationships with patients and ICT suppliers, and non-transferable clinical or technical expertise in the form of institutionalized certificates of cultural competence. In addition, symbolic capital was also valued, including technicians’ involvement in previously successful ICT development projects and clinician’s experience in delivering prenatal care. These constrained forms of capital along with the habitus, led to the pursuit of conflicting goals in the social field. For instance, clinicians were primarily motivated to utilize their domain expertise within the project, and consequently their level of engagement with the technical aspects of the requirements gathering process varied over time. Similarly, technicians were more preoccupied with utilizing their technical expertise in practice and at times may have paid less attention to clinical issues.

	Field	Habitus	Capital
Social System	Practice was affected by both the structure of the social system and social field. For instance, explicit rules were put forward from the scientific body that awarded funding for the research. This was accompanied by more implicit rules such as around the division of work, and engagement. Meanwhile, in the social system, rules were specified by the involved institutions / organizations themselves, and various regulations in the macro-environment such as data protection, ethical standards, and medical protocol.	Each actor came into the project with expectations around the habitus based on previous engagement with other research projects i.e. the schemata of perception, thinking, feeling, evaluating, and speaking. This changed dramatically over time based on continuous interactions between actors and changes within practice. For instance, three requirement gathering workshops were organized involving all actors which helped to form a shared language and frame of reference for discussing the project's objectives.	Each actor possessed valuable capital acquired in the social system which allowed them to engage in practice. For instance, clinicians possessed cultural capital such as access to clinical knowledge, cultural objects (i.e. medical protocol, clinical guidelines, and health records), and social capital such as relationships with patients, medical practitioners, the ethics committee. Technicians possessed IT expertise and had access to cultural objects such as technology stack documentation, and medical devices.
Personality System	Each actor had a unique identity molded by the personality system which affected their interactions in the social field. Clinicians were primarily motivated to engage in action around the clinical trial, whereas technicians were more motivated to undertake action in relation to systems development. This also affected the commitment levels of different groups over the course of the project.	The personality system had a strong influence on the habitus of each actor and motivated their course of action. For instance, the habitus of clinicians prioritized patient interactions over technology development as the most important action point in the project. In contrast, the habitus of technicians saw requirements gathering and the agile development process as the primary course of action.	Technicians were more motivated to utilize their institutionalized capital in the form of mobile development, technology integration, security and testing. Meanwhile, clinicians were more motivated to utilize institutionalized capital in the form of clinical trial management, documenting new clinical guidelines, and submissions to the ethics committee.
Cultural System	Actors came from very different cultures, and prior to the commencement of the project no one had previous exposure to the other domain of practice. This led to challenges early on in developing shared meaning and values. For instance, knowledge of the patient pathway was assumed by clinicians, but technicians were unaware of the intricate details. A series of workshops were organized in order to map this pathway and derive a shared meaning of values, and assumptions around requirements.	The cultural system and underlying assumptions of each actor also had a strong impact on the habitus in terms of which course of action was selected. For example, technicians had the underlying assumption that requirements had to be documented before development resources could be expended, whereas clinicians' underlying assumption was that prototypes were required before requirements could be finalized. This led to conflict initially around the course of action.	The cultural system affected which forms of capital were valued in the practice. For instance, symbolic capital was highly valued during the course of the project. For technicians, their symbolic capital was their technical expertise and achievements in successful systems development. While for clinicians it was their clinical domain expertise, and achievements in successfully running a clinical trial.

Table 12: Typology for Organizational ICT Practice Findings

As previously mentioned, these findings are unlikely to emerge using alternative theories as a lens for understanding sociomaterial practice. In particular, the typology of organizational ICT practice highlights the impact of social structure, personal motivations, and culture, as well as localized factors, such as changes in the social field, the habitus of actors, and power asymmetries. We feel these insights are essential for understanding sociomaterial practice in order to design artifacts which help improve current systems. Without a proper understanding of these factors, designed artifacts are unlikely to be successful as they will not adequately reflect the elements of practice or larger action system.

The case study shows how the enactment of organizational ICT practice is shaped by both the elements of the action system and practice. Ignorance of these underlying factors can potentially hinder collaboration and create conflict due to issues such as the absence of a shared understanding. The typology of organizational ICT practice helps elucidate these issues by studying the elements of the action system and practice, thus contributing to a better understanding of the underlying factors that can influence the course of social action.

5.5. Concluding Remarks

In this paper we have presented a typology for organizational ICT practice which combines seminal literature from Parsons and Bourdieu with more contemporary ideas around sociomateriality. The resulting theoretical contribution provides empirical insights into the underlying factors which need to be investigated in order to gain a holistic understanding of sociomaterial practice.

One limitation of this paper is that is does not turn attention towards how the outlined typology could be used by designers to create artefacts which will be introduced into organizational ICT practices. Future research will aim to address this limitation by proposing a design lens for organizational ICT practice. In addition, future research will be carried out to apply the typology to other domains.

One noteworthy finding that emerged during our application of the typology for practice to the connected health project was how it described and perhaps even pre-empted the influence of different professions (or tribes) on the practices. In particular, two tribes were identified: that of clinicians from the healthcare profession and technicians from the IT development profession.
One way of understanding the identities of social actors is by categorizing the Community of Practice that they are members of. Communities of Practice, consist of three main elements: *domain, practice, and community* (Wenger, McDermott, & Snyder, 2002). Firstly, Communities of Practice require a shared *domain* of interest in which members commit to. For instance, the domain in question might be IT development or healthcare. In addition, members must continuously or intermittently collaborate, maintain relationships, and share learnings and knowledge within a *community* environment (Wenger, McDermott, & Snyder, 2002). Without this sustained interaction, the Community of Practice is unlikely to survive and prosper. Finally, members of the Community of Practice should be actively engaged in *practice* and contribute to a shared resource base. The shared resource base develops over time through repeated interactions between members and assists them in addressing challenges. The relevance of Communities of Practices to our case study also merits further research going forward in order to re-examine the empirical evidence in light of this finding.

Postface to Chapter

The next chapter moves beyond the preliminary findings presented in this chapter. It provides a more complete discussion of empirical findings from the in-depth case study of the CHP project in order to strengthen both the theoretical and practical contributions. Chapter 6 also builds on the theoretical framework by specifying shared understanding and shared commitment as variables, and distributed ISD projects as the research context.

Chapter 6: Towards a Framework for Shared Understanding and Shared Commitment in Agile Distributed ISD Project Teams[3]

Preface to Chapter

Chapter 6 seeks to answer the following research question: *How do these factors interplay with team interactions in distributed ISD projects to affect shared understanding and shared commitment?* This chapter builds on Chapter 5 by applying the evolving theoretical framework to analyse in-depth case study findings from the CHP project. However, in contrast to Chapter 5, the delineation between individuals and objects is replaced by the more inclusive term of 'team interactions', as per the works of Latour (2007). For instance, team interactions refer to how individual team members interact with each other and with different objects (i.e. project deliverables and the IT artefact under development) in order to achieve set objectives during the conduct of a distributed ISD project.

The second iteration of the theoretical framework is presented which clarifies the variables that will be investigated (i.e. shared understanding (SU) and shared commitment (SC)). The theoretical constructs are also renamed slightly to move away from the somewhat archaic language of Parsons and Bourdieu while still preserving the meaning behind these constructs. For instance, Parsons' concept of "social system" is replaced with the term *structure*, "personality system" is replaced with the term *identity*, and "cultural system" is replaced with *culture*. Meanwhile, Bourdieu's concepts of "field", "habitus", and "capital" are replaced with the terms *vision, approach*, and *means*. This decision was motivated by a desire to adapt the language to a distributed ISD context. In addition, the column and row headings of the framework are swapped in the second iteration of the theoretical framework to improve readability.

[3] This chapter is based on a paper published in the proceedings of the 2019 European Conference on Information Systems (ECIS2019), Stockholm, Sweden, June 2019.

The paper upon which the chapter is based was submitted to the "Managing IT Projects in a Digital World" track at ECIS. The paper therefore directs attention towards agile as a method for conducting distributed ISD practices. However, as previously mentioned, the dissertation focuses on a *social perspective* of ISD (i.e. the study of team interactions) rather than a *production perspective* of ISD (the study of methods, techniques and tools). Therefore, discussions on the agile methodology are limited to this chapter.

Abstract

Agile distributed Information Systems Development (ISD) is an innately social process in which distributed team members must continuously interact to develop new IT solutions. Existing literature suggests that shared understanding and shared commitment are essential for the effective functioning of agile distributed ISD project teams; however, the factors that shape the emergence of these two phenomena remain elusive. In this paper, we seek to develop a framework for investigating the interplay of factors that shape shared understanding and shared commitment during agile distributed ISD project team interactions. We draw on in-depth case study findings from an agile distributed ISD project called the "CHP project" which involved team members from diverse backgrounds such as academia, healthcare, and industry. The study reveals that shared understanding and shared commitment in agile distributed project teams are shaped by the dynamic interplay between macro-level (contextual) and micro-level (localised) factors. In particular, we find that diverse macro-level structures, identities, and cultures interplay with the micro-level vision, approach, and means of the project to impact shared understanding and shared commitment. Empirical findings also suggest that the absence of shared understanding and shared commitment can sometimes be constructive as conflict allows team members to air differences of opinion.

6.1. Introduction

Agile distributed Information System Development (ISD) projects are increasingly employed by organizations to develop IT solutions in dynamic environments (Matook & Maruping, 2014; Persson, Mathiassen, & Aaen, 2012; Russo, Fitzgerald, & Shams, 2013). This trend has been enabled in part by the opportunities afforded by sophisticated mediums such as video conferencing and knowledge management systems which allow team members from different geographical and organizational backgrounds to collaborate using agile methodologies. However, despite these opportunities, the conduct of agile distributed ISD projects remains far from a straightforward task (Ramesh, Cao, Mohan, & Xu, 2006). Despite the growing body of literature, The Standish Group (2015) suggest that the rate of agile ISD project failure continues to remain stubbornly high. In particular, social aspects of development are increasingly seen as a key determinant of performance differences among agile distributed ISD project teams as they can threaten to derail a project if not properly addressed (Dyba & Dingsoyr, 2009; Persson, Mathiassen, & Aaen, 2012; Ramesh, Mohan, & Cao, 2012). For instance, the performance of agile distributed ISD teams can be hampered due to complexities around the team structure, contention between team members' identities, and uncertainty arising from cultural differences in the team (Hoda, Noble, & Marshall, 2013; Holmström, Fitzgerald, Ågerfalk, & Conchúir, 2006; McCarthy, O'Raghallaigh, Fitzgerald, & Adam, 2018a; Ramesh, Mohan, & Cao, 2012; Sarker, Munson, Sarker, & Chakraborty, 2009; Sharp & Ryan, 2011).

This can in turn lead to seemingly irreconcilable differences among individuals where the creation of clear and agreed solutions is inhibited due to the fragmented perspectives of individuals (Conklin, 2005; Sawyer, Guinan, & Cooprider, 2010). Consequently, literature suggests that the effective functioning of agile distributed ISD project teams rests on their ability to reach a shared understanding and shared commitment during team interactions (Hummel, Rosenkranz, & Holten, 2016; Yu & Petter, 2014). Shared understanding refers to where team members concur on the properties and interpretations of an IT artefact, while shared commitment refers to where team members dedicate time and resources in line with proposals that have gained a shared understanding (Bittner & Leimeister, 2014; Hummel, Rosenkranz, & Holten, 2016; Windeler, Maruping, Robert, & Riemenschneider, 2015; X. Yang, Tong, & Teo, 2015). Conklin (2005) suggests that shared understanding alone is insufficient for team performance as the absence of shared commitment can negatively impact on team member's level of engagement in project tasks leading to timeline delays.

However, existing literature has yet to explore the interplay of factors that impact shared understanding and shared commitment in agile distributed ISD projects. There is also a recognition among scholars that new theoretical frameworks are needed to understand the unique characteristics of agile ISD projects in distributed environments (cf. Yu & Petter, 2014). Therefore, we seek to address the following research question: *What factors affect shared understanding and shared commitment during agile distributed ISD project team interactions?* Empirical findings from the in-depth case study of an agile distributed ISD project undertaken in the healthcare sector are offered to explore and provide insights into this research question. The "Connected Health Platform (CHP) project" was a collaborative effort between partners from academia, healthcare, the IT sector, and insurance sector, and involved team members from diverse backgrounds. A theoretical framework called the 'Typology for Organizational ISD Practice' (McCarthy, O'Raghallaigh, Fitzgerald, & Adam, 2017, 2018a) is used to describe and explain team interactions in this in-depth case study. The findings point to the variegated interplay of factors that shape shared understanding and shared commitment during agile distributed ISD team interactions.

The remainder of the paper is structured as follows: Section 2 provides a literature review of agile distributed ISD projects, shared understanding and shared commitment. Section 3 outlines the theoretical development of the paper and Section 4 introduces the research design behind our in-depth case study of the CHP project. Section 5 discusses the findings from the in-depth case study and Section 6 presents a discussion of these findings. Section 7 then brings the paper to a close with a conclusion.

6.2. Literature Review

6.2.1. Agile Distributed ISD Projects

Agile distributed ISD project teams typically consist of individuals from dispersed geographical and organizational backgrounds who are brought together to develop systems using an agile methodology (i.e. Scrum or Extreme Programming) (Hummel, Rosenkranz, & Holten, 2016; Persson, Mathiassen, & Aaen, 2012; Ramesh, Mohan, & Cao, 2012). The conduct of agile distributed ISD projects is an inherently social activity in which team members must interact across boundaries to share ideas, resolve contention, and coordinate resources to achieve user requirements (Conboy, 2009; Dyba & Dingsoyr, 2009; Sarker, Munson, Sarker, & Chakraborty, 2009). These emergent team interactions in turn allow agile distributed ISD team members to clarify and work through any underlying differences in perspectives. Some scholars argue that ISD primarily concerns the social construction of knowledge, where critical insights around the development of a system arise through team interactions (Luna-Reyes, Zhang, Gil-García, & Cresswell, 2005; Sawyer, Guinan, & Cooprider, 2010; Star, 1989). Accordingly, team performance rests on the ability of individuals to continuously integrate knowledge around systems development (Aladwani, 2002b; Lycett & Paul, 1999; Sawyer, Guinan, & Cooprider, 2010). For instance, literature suggests that distributed ISD teams can help overcome the knowledge gap of any one individual and generate novel solutions for tackling identified problems (Conchúir, Ågerfalk, Olsson, & Fitzgerald, 2009; Kankanhalli, Tan, & Wei, 2006).

However, studies have also pointed towards the challenges that can arise in agile distributed ISD teams, particularly around how agile methodologies are applied across distributed environments (Holmström, Fitzgerald, Ågerfalk, & Conchúir, 2006; Persson, Mathiassen, & Aaen, 2012). Agile ISD projects are time-critical in nature and demand close interactions between team members (Holmström, Fitzgerald, Ågerfalk, & Conchúir, 2006; Yu & Petter, 2014). In addition, challenges can arise during distributed team interactions due to contextual differences between team members' structural positions, identities, and values and the highly fragmented and localised nature of knowledge. For instance, team members from distributed organizational backgrounds and cultures may find it more difficult to interact due to the lack of cognitive familiarity with knowledge sources outside their own domain (O'Raghallaigh, Sammon, & Murphy, 2011; Strober, 2006). This is especially true in ISD project teams such as in the healthcare sector, which often engage a complex matrix of different disciplines such as developers, designers, analysts, project managers, and clinicians from a range of medical specialties. Moreover, the difficulties are heightened in agile distributed ISD environments where team members from dispersed geographical, organizational, and temporal backgrounds are expected to sustain high levels of team interaction and complete rapid iterations of systems development (Persson, Mathiassen, & Aaen, 2012). As pointed out by Sharp, Ryan, and Prybutok (2014), face-to-face interactions between stakeholders is a fundamental principle of the original Agile Manifesto; consequently, the applicability of agile development methods to distributed ISD project teams has been questioned by some scholars (Ramesh, Cao, Mohan, & Xu, 2006). However, Sharp, Ryan, and Prybutok (2014) find that rather than precluding the use of agile methods in distributed ISD teams, the core principles of the Agile manifesto create a need for alternative team structures in terms of task design, core norms, and team compositions e.g. keeping distributed agile ISD teams as small as possible.

6.2.2. Shared Understanding and Shared Commitment

In light of these challenges, existing literature suggests that shared understanding is essential for the performance of agile distributed ISD project teams (Hummel, Rosenkranz, & Holten, 2016; Yu & Petter, 2014). Shared understanding refers to the social process whereby the divergent knowledge of individual team members is transformed to generate collaborative knowledge building (Arias, Eden, Fischer, Gorman, & Scharff, 2000; Kleinsmann & Valkenburg, 2008; Puntambekar, 2006). Shared understanding does not necessarily imply that everyone shares exactly the same viewpoint; however, it does require team members to recognise differences in their interpretations and work towards collaborative knowledge building. Shared understandings can be fostered through continued dialogue among team members, with a view to negotiating differences in positions, interests, and shared meanings (Bittner & Leimeister, 2014). However, shared understanding alone is not enough, and shared commitment is equally required to ensure that solutions can be effectively delivered during agile distributed ISD team interactions. Conklin (2005) asserts that shared understanding is a precursor to fostering shared commitment among team members, and shared commitment cannot arise in the absence of shared understanding. Having said that, shared commitment goes beyond the transfer of information and knowledge, and requires the commitment of time, effort, and resources by agile distributed ISD team members in line with proposals that have gained shared understanding (Briggs, Kolfschoten, & Vreede, 2005; Conklin, 2005; Newman & Sabherwal, 1996).

The ability of a team to reach shared understanding and shared commitment is often complicated in agile distributed ISD projects by the typically fluid team boundaries, rapid development cycles, and contention arising from the unique roles, interests, and values of stakeholders involved (Holmström, Fitzgerald, Ågerfalk, & Conchúir, 2006; McCarthy, O'Raghallaigh, Fitzgerald, & Adam, 2018a; Persson, Mathiassen, & Aaen, 2012). Agile teams are typically self-organising and self-driving which can also create challenges around team coordination in the structure of distributed ISD teams (Hoda, Noble, & Marshall, 2013; Holmström, Fitzgerald, Ågerfalk, & Conchúir, 2006). Furthermore, the integration of knowledge may be hampered in agile distributed projects by deep-seated differences between team members' organizational and geographical backgrounds, and constrained timeframes for collaboration (Edmondson & Nembhard, 2009; Schippers, Den Hartog, Koopman, & Wienk, 2003). As a result, Yu and Petter (2014) assert that more research is needed to study 'the black box' of shared understanding in agile ISD practices while Hummel, Rosenkranz, and Holten (2016) point towards opportunities for future research on shared understanding in agile distributed ISD teams. Existing literature on shared commitment in agile distributed ISD project teams is limited, which also suggests opportunities for research.

6.3. Theoretical Background

This paper presents a theoretical framework called the Typology for Organizational ISD Practice (McCarthy, O'Raghallaigh, Fitzgerald, & Adam, 2017, 2018a). Theoretical development was grounded in empirical findings and existing literature from the fields of sociology and information systems (O'Raghallaigh, Sammon, & Murphy, 2010). For instance, the framework includes insights from the seminal works of Parsons (1937, 1951, 1964) and Bourdieu (1977, 1986, 1990) alongside more recent literature on how the social and material come together in practice (Faulkner & Runde, 2010, 2013; Latour, 2007; Leonardi, 2010, 2012; O'Raghallaigh, McCarthy, & Adam, 2017; Suchman, 2007). In particular, it focuses on how shared understanding and shared commitment is shaped by the interplay between the macro-level factors of structure, identity, and culture, micro-level factors of vision, approach, and means, and team interactions. The justification for this theoretical lens is that it lays the foundation for discussions around how shared understanding and shared commitment arise in agile distributed ISD teams consisting of individuals from diverse organizational and geographical backgrounds. In particular, the context of our study (i.e. agile distributed ISD projects) has unique implications for the relationship between macro-level and micro-level factors. For instance, agile distributed ISD project teams are characterised by a diversity of structures, identities, and cultures; this in turn creates unique social challenges around formulating a vision, approach, and means. In addition, agility generates a heightened need for continuous interaction among the team, which can make the emergence of shared understanding and shared commitment more chaotic and dynamic.

Following the works of Latour (2007), we assert that neither the macro-level nor micro-level exist completely independently of each other, and instead there is a continuous interplay with team interactions. The macro-level refers to the contextual patterns that persist over time while the micro-level focuses on the localised processes of communication among team members (Latour, 2007). Latour (2007) asserts that it is misguided to take either component as a starting point, and instead the inquirer should remain a reflexive loop behind the social group they are studying. Based on this, the Typology for Organizational ISD Practice looks at how the interplay between macro-level factors, micro-level factors and team interactions impacts the ability of team members to reach a shared understanding and shared commitment. This sets the foundation for discussions around the emergence of shared understanding and shared commitment in agile distributed ISD project teams.

The Typology for Organizational ISD Practices looks at three macro-level constructs that were identified as primary factors in shaping participants' interactions within practice: Structure, Identity, and Culture. Structure deals with the positions of team members in terms of the roles, hierarchies, and social rules that help them interpret situations and select appropriate courses of action. For instance, an individual's course of action during an agile ISD project could be influenced by their role within their profession, organization, as well as the project itself. Identity meanwhile deals with the interests of team members which motivates them to pursue goals across different situations. For instance, an individual's action in an ISD project could be motivated by their interest in developing a novel IT solution (professional), pursuing their career ambitions (personal), or achieving departmental objectives (collective). Finally, Culture refers to the shared meanings that are internalised by team members over time. This can include cultural artefacts such as language, values and assumptions which are utilised by team members in practice. For instance, individuals following an agile methodology to ISD would value working code over high levels of documentation, and people over processes (cf. Conboy, 2009).

The typology then turns attention towards how these macro-level and micro-level constructs interplay with team interactions. In particular, the typology focuses on three dimensions of ISD practice: vision, approach, and means. The construct of vision deals with the future path of action that will be pursued by team members through the conduction of practice in the field.

Approach then refers to the 'modus operandi' of practice which is guided by the tacit knowledge that team members have acquired through their accumulated experience in practice. Means refers to the resources utilised by team members in the field i.e. economic and social capital. Bourdieu (1990) asserts that knowledge is always acquired through experience, and this knowledge allows team members to get a 'feel for the game' and adjust to changes in the field of practice and the larger social context.

Table 13 presents the Typology for Organizational ISD Practice, which aims to assist the researcher in describing and explaining interactions between team members involved in ISD practices. In particular, the framework investigates how the interplay between structure, identity and culture (macro-level), vision, approach, means (micro-level) and team interactions affect shared understanding and shared commitment.

	Structure	**Identity**	**Culture**
Vision	Examines structure (e.g. roles, rules, and hierarchy positions) and its impact on team members' shared understanding of and shared commitment to a vision.	Examines identity (e.g. personal, professional, collective) and its impact on team members' shared understanding of and shared commitment to a vision.	Examines culture (e.g. meanings, values, assumptions) and its impact on team members' shared understanding of and shared commitment to a vision.
Approach	Examines structure (e.g. roles, rules, hierarchy positions) and its impact on team members' shared understanding of and shared commitment to an approach.	Examines identity (e.g. personal, professional, collective) and its impact on team members' shared understanding of and shared commitment to an approach.	Examines culture (e.g. meanings, values, assumptions) and its impact on team members' shared understanding of and shared commitment to an approach.
Means	Examines structure (e.g. roles, rules, and hierarchy positions) and its impact on team members' shared understanding of and shared commitment to a means.	Examines identity (e.g. personal, professional, collective) and its impact on team members' shared understanding of and shared commitment to a means.	Examines culture (e.g. meanings, values, assumptions) and its impact on team members' shared understanding of and shared commitment to a means.

Table 13: Typology of Organizational ISD Practice (Version 2)

6.4. Research Design

An in-depth case study approach (cf. Eisenhardt, 1989; Walsham, 1995; Yin, 1994) was undertaken to explore the factors that impacted shared understanding and shared commitment during the conducti of agile distributed ISD projects. In-depth case studies are well suited to exploring how emergent phenomena such as shared understanding and shared commitment arise in practice (cf. B. Kaplan & Maxwell, 2005). A purposeful, theory-based sampling strategy (cf. Patton, 1990) was chosen to select an information-rich case to examining the theoretical constructs of shared understanding and shared commitment. The in-depth case study centred on the CHP project, an agile distributed ISD project undertaken in the healthcare sector which sought to develop a connected health platform for monitoring the wellbeing of expectant mothers across different settings such as the maternity hospital, local GP clinics, and expectant mother's own home. The platform integrated a number of different IS artefacts including a smartphone app, home blood pressure monitor, and urine analyser for use by expectant mothers, and Electronic Health Record for use by clinicians. In particular, the project focused on the detection of hypertensive disorders of pregnancy, a major cause of maternal and neonatal mortality and morbidity worldwide. A research study was also conducted involving expectant mothers (n=50) which sought to improve the management and treatment of hypertension during pregnancy.

The agile ISD project was a collaborative effort involving organizations from academia, healthcare, and industry, and involved a distributed team consisting of a Principal Investigator (PI), a clinical lead, clinical researcher, research nurse, project manager, a full-time and part-time developer, an analyst, and a data architect. The team members were geographically and organizationally dispersed and came from diverse organizational and geographical backgrounds which in turn created challenges around shared understanding and shared commitment. Based on interviews with team members, these differences were found to also lead to the emergence of two dominant subgroups in the team: the 'clinicians' which included the clinical researcher, and clinical lead, and ‘technologists’ which included a project manager, two developers, and an analyst. The subgroups had to collaborate to achieve numerous stretch goals despite the scarcity of resources at their disposal.

Qualitative data was triangulated using three data gathering techniques: participant observations, interviews, and project documents. Firstly, the lead author was granted exceptional access to the live project setting which allowed him to carry out over 300 hours of in-depth participatory observations in the field for a period of six months (June 2015 to January 2016). Participant observations allowed the lead author to gain rich insights into peoples’ actions, and directly observe events as they unfolded. In addition, semi-structured interviews each lasting about an hour were then conducted with the ten individual team members to gain further in-depth insights into the project. The interviews provided rich accounts of the research subject’s personal experiences in their own words and their view of reality based on interactions between team members in practice. Finally, the lead author also had access to project documents throughout the development phase which included emails, published and unpublished reports, and project notes. These documents offered a concrete account of the phenomenon of interest once they were judged to be relevant, reliable, and complete.

A directed approach to content analysis was adopted to organize findings into common themes based on the constructs of the Typology for Organizational ISD Practice. The lead author continuously reread the interview transcripts in order to identify codes of interest including variables such as concepts and properties, as well as the relationship between these variables (Miles & Huberman, 1994). As part of the data analysis and theory building process, the researcher’s perception of variables and relationships, otherwise referred to as theoretical sensitivity, was influenced by a reading of literature. Participant observation data and project documents were also analysed by the lead author using the data analysis technique of vignettes, which provided “a focused description of a series of events taken to be representative, typical, or emblematic in the case” (Miles & Huberman, 1994, pg. 81). This technique allowed the researcher to produce, reflect, and learn from data around key moments in the ‘everyday life’ of the project (Miles & Huberman, 1994).

The unit of analysis is practice, and an embedded unit of analysis focuses on the actions and interactions of team members and objects in this practice. Practice can be defined as the situated and temporal nexus of action which continuously unfolds in the social world (Nicolini, 2012; Schatzki, 1997). Practice highlights the importance of both the human body as an instrument for action, and the contribution of material objects in the enactment of practice.

6.5. Findings

6.5.1. How did Structure Affect Shared Understanding and Shared Commitment in the Agile Distributed ISD Project?

Vision: Findings suggest that uncertainty around the roles of the agile distributed ISD team impeded a shared understanding of and shared commitment to the project vision. For instance, despite being requisitioned as a dedicated project resource, the clinical researcher's role in the project became more uncertain over time as she began to take on more obligations in the hospital where she worked and engaged less in project tasks. Similarly, the clinical lead was often unavailable to attend project meetings due to obligations in the maternity ward which made her role in the agile distributed team more unclear. As stated by the clinical lead: "*When you have clinicians who are functioning as clinicians and not scientists, there's always competing demands and limited bandwidth. Meetings are set up and the clinicians aren't there, or they are and they leave*". As a result, the technologists felt that they were alone in their efforts to clarify the vision as the clinicians' availability was subject to change. Meanwhile, the clinical lead noted that she felt the project proposal had "*worked through*" any issues around the vision and she was satisfied that "*(the vision was) figured out … I can scope out the clinical needs and the regulatory issues, what the patient needs and what the doctor wants, and the impact that will have*". However, technologists felt that the uncertainty around the structural involvement of clinicians over time meant that important aspects of the vision could not be addressed, and technologists encountered delays when waiting for email feedback on what clinical workflows the proposed solution would address.

Approach: The PI had envisioned that the clinicians and technologists would collaborate closely during the agile distributed ISD project and formulate an agreed approach to systems development; however, findings suggest that inequalities between the structural positions of team members oftentimes impeded a shared understanding and shared commitment. Technologists felt that they *"were seen to own nearly every single deliverable"* as clinicians had implicitly transferred responsibility for project deliverables and associated tasks to them. For instance, one developer observed that the team structure resembled that of a client-provider relationship where the clinicians "*see themselves as the client… and we're a development house. Clinicians wouldn't view us as one team*". This issue became problematic at the end of the development phase when the clinicians demanded that the requirement for an automated gestational age calculator be delivered, despite the feature having previously been ruled out of scope. This event exemplified the chasm in shared understanding and shared commitment that had emerged over time in the team as it placed the technologists under considerable pressure to finalise the system before the impending deadline. However, the clinicians seemed unconcerned about how this would impact the approach to systems development as they had shifted full responsibility to the technologists.

Means: Findings also suggest that clinicians were imbued with structural power to veto the connected health platform solution. This power seemed to be derived from their experience in perinatal research, access to patients, and their recognised expertise in clinical trial management. As noted by the data architect: "*Clinicians had power in justifying the project... You could do a great job developing a solution but unless the clinicians evaluate the solution positively it will not be judged as a success*". Based on this, the technologists made repeated requests for the clinicians to finalise actions related to the requirements gathering process however, an email response was not always forthcoming and the technologists were concerned that this would impact on the timeline and lead to scope creep later on. The developer noted that based on his persistent questioning, the clinicians "*see me as someone who makes* *life difficult… they (forget) I exist, until I turn up as risk somewhere*". However, the clinical researcher later noted that she "*didn't have a problem with the amount of questions asked but I felt I had to revert to (the clinical lead)*" as the unclear team hierarchy affected her confidence in making decisions. For instance, in the absence of the clinical lead, the clinical researcher had made decisions around the project scope during the first two workshops; however, the majority of these decisions were reversed when the clinical lead attended the next workshop. As a result, the technologists felt that shared understanding and shared commitment were compromised by this hierarchy as the finality of decisions was always contentious.

6.5.2. How did Identity Affect Shared Understanding and Shared Commitment in the Agile Distributed ISD Project?

Vision: The project manager felt that it was essential to build a vision of '*what was best for the project'* in order to bridge divergent identities in the agile distributed ISD team. However, reconciling these differences in identity through shared understanding and shared commitment proved to be a challenging task. For instance, the technologists' interest in the project initially centred on the technologies that would be used to develop the connected health platform, whereas clinicians were more interested in studying existing healthcare services. Neither subgroup had a complete understanding of both the technical and clinical aspects of the vision. However, over time the technologists eventually became well versed in the workflow and guidelines associated with perinatal care, and were able to communicate competently to clinicians around the vision, despite having little to no knowledge of the obstetrics domain prior to the project. As stated by the clinical lead: "*I may have occasionally forgotten that they're (technologists) not clinicians because they talk so knowledgably… I forget and assume that they'll know something that's not that obvious if you're not clinically trained*". In contrast, the clinicians found it more challenging to become familiar with the ISD domain and struggled to fully understand the vision. The clinicians' interests in the project vision also became more uncertain over time as their level of engagement decreased which constrained the level of shared understanding and shared commitment as a result.

Approach: There were also considerable challenges associated with the identity of different partners in the approach. In particular, a number of contentious conversations took place between members of the university research centre and members of the multinational IT company which centred on the university research centre's interest in using open source solutions to build the connected health platform, and the IT company's interest in using proprietary solutions. Meetings between the technologists in the university research centre and the multinational IT company often became quite heated such as when a member of the multinational IT company indicated that "*we own you*" to the technologists, given their expectation of a return on investment in the project. Despite this, the argumentative process in the end strengthened the relationship between the multinational IT company and university research centre, and over time, helped to develop a shared understanding and shared commitment. Nevertheless, this shared commitment did not extend to all commercial partners, and the technologists still faced considerable challenges in getting members of the IT start-up company to commit to the project plan, work descriptions, and estimation of person-days involved. This reached a boiling point during one meeting, when a member of the IT start-up company walked out after the project manager delivered an ultimatum which demanded the partner to commit to a project plan. Members of the IT start-up company maintained that they could not afford to commit resources due to organizational constraints however, the technologists felt that instead this was related to their questionable interest in the project. As a result, technologists took steps to reduce interdependencies with the IT start-up company as a compromise did not seem possible.

Means: While shared understanding of the vision and approach increased over time, this understanding did not map directly to a shared commitment around the means of the agile ISD project due to differences in identity. Team members' hesitancy to commit resources towards the project affected their commitment to tasks associated with the design of the connected health platform. In particular, the clinicians and IT start-up company did not adopt a shared ownership of the project deliverables and as a result, technologists felt isolated in their acute awareness of the challenges faced in delivering a solution. For instance, the resources available in the project and the timeline specified for completion were very constrained compared to scale of the solutions that were proposed. Consequently, the technologists decided to utilise techniques to shortcut requirements gathering such as prototyping, journey mapping, personas, and storytelling in order to effectively manage constrained resources. As stated by the project manager: "*the budget and timeline didn't allow us to be anything but very agile… considering the timeline and the budget…. when you look at the project you realise the amount of time that brains saved over brawn"*. The technologists invested significant time in organising Joint Application Development (JAD) workshops where tools such as journey mapping and prototyping were used to focus conversation between members of the agile distributed ISD project team. However, despite these efforts, the clinicians were less sensitised to the time and resource pressures given their lack of shared ownership of the project, and their engagement with the prototypes and journey maps eventually decreased.

6.5.3. How did Culture Affect Shared Understanding and Shared Commitment in the Agile Distributed ISD Project?

Vision: The project manager was mindful that aligning shared meanings, values, and assumptions would be a key challenge given the distributed nature of the agile team. In addition, the project proposal had not been made available to most team members at the beginning of the agile ISD project and therefore the project manager felt "*people believed a lot in the project but not many shared a common understanding of what it was about. Also I think different people were committed to different things*". For instance, this lack of shared understanding was apparent from the clinical researcher's puzzling assumption that she would be developing the connected health platform by herself, despite having no previous experience in managing agile distributed ISD projects: "*I assumed I would work on the project by myself. I thought I needed to take computer classes, learn about platform, create mobile apps,* *connecting devices… which was very scary*". There were also cultural challenges around how to encourage distributed collaboration around the vision, and overcome disciplinary boundaries. The vision was neither wholly technical nor wholly clinical, and therefore demanded shared meaning among all team members. However, team members initially did not realise that the formulation of the vision required both a shared understanding and shared commitment among all disciplines. The project manager and analyst therefore took steps to ensure that both clinicians and technologists would be readily engaged in the vision and scheduled a series of JAD workshops to help sustain close interactions between team members.

Approach: Differences in cultural shared meanings were also observed between technologists and clinicians in their shared understanding of an approach. At the beginning of the project, the technologists had also been surprised when during a PowerPoint presentation on the proposed approach, the clinical researcher had asked the question: "*what do you mean by a project?*". The clinical researcher later noted during an interview that while technologists *"always think in terms of projects… clinical work is different to project work*" and prior to working on the CHP project she had mainly worked *"on short timelines*". Therefore, the clinical researcher noted that she was not accustomed to the need for project planning. However, while shared understanding of the project plan increased over time through regular meetings, shared commitment to the assignment of project work still remained a challenge. One developer observed that "*Techies need to plan ahead but clinicians are used to firefighting*", and parallels were also drawn by interviewees between each team member's approach and the shared meanings of their community of practice more broadly. For instance, clinicians' shared meaning of the approach was influenced by the routine triaging of hospital work based on urgency, and the deference of certain decisions until key information became available; in contrast technologists' perceptions about project work was coloured by their awareness of the costs associated with poorly defined requirements and system failures, and their focus on risk mitigation.

Means: Technologists felt that the clinicians' perceived cultural value of IT skills was also low, which reduced shared commitment during the agile development process. For example, during a later iteration, the developers installed a demo version of the Electronic Health Record (EHR) on a virtual machine and made it available online for 5 days a week, 8 hours a day in the expectation that clinicians would login regularly to provide feedback on the EHR's features. However, technologists questioned the value clinicians placed on this live demo when the login records showed that little to no attempts had been made by the clinicians to engage with the EHR. In addition, clinicians' engagement with the requirement documents of the connected health platform was also perceived to be low. As noted by the data architect: "*I know the project manager and I read (the requirement documents) but my impression was that no one else read them. They were more beneficial on the technology side but it was challenging to engage clinicians and they didn't work particularly well*". Instead, the technologists had to schedule meetings with the clinicians in order run through the gathered requirements face-to-face. However, technologists still struggled to gain written sign-off of the requirements documentation, and instead proceeded on the assumption that implicit sign-off had been provided by the clinicians.

6.6. Discussion

The findings illustrate how the interplay between macro-level (structure, identity, and culture), micro-level (vision, approach, and means) factors and team interactions impact shared understanding and shared commitment. Based on these findings, we suggest that macro-level and micro-level factors can become a 'molasses' or 'syrup' which seeps into practice and affects the ability of team members to reach a shared understanding of and a shared commitment to the agile distributed ISD project. In particular, this interplay can have a moderating influence on shared understanding and shared commitment across different aspects of the agile distributed ISD project. For instance, seemingly irreconcilable differences between the structures, identities, and cultures of team members can curtail shared understanding and shared commitment, and constrain team performance as a result. Table 14 offers a summary of the findings using the Typology for Organizational ISD Practice. The following paragraphs then discuss the implications for shared understanding and shared commitment in agile distributed ISD projects.

	Structure	Identity	Culture
Vision	Despite the collaboration envisioned, clinicians' structural positions in the hospital impeded their involvement in project work. This impacted the teams' ability to reach a shared understanding of and shared commitment to a vision.	Differences between the interests of technologists and clinicians were seen to affect their engagement levels and impacted the team's ability to reach a shared understanding of and shared commitment to a vision.	Cultural factors such as the lack of shared meanings emerged as a barrier to distributed team collaboration, and impacted the teams' ability to reach a shared understanding of and shared commitment to a vision.
Approach	The emergence of perceived inequalities between the positions of technologists and clinicians in the project, and hierarchies on the clinical side impacted the teams' ability to reach a shared understanding of and shared commitment to an approach.	Contention between the interests of the university research centre and multi-national IT company, as well as the SME's reluctance to commit to the project plan impacted the teams' ability to reach a shared understanding of and shared commitment to an approach.	Cultural differences were perceived between technologists' desire for in-depth planning and clinician's focus on 'firefighting' which thus impacted the teams' ability to reach a shared understanding of and shared commitment to an approach.
Means	The lack of shared ownership of project deliverables, and clinicians' imbued power to veto project deliverables impacted the team's ability to reach a shared understanding of and shared commitment to the means.	The clinicians and SME's hesitance to commit resources toward project deliverables and the technologists' isolated concern around the resource shortfalls impacted the teams' ability to reach a shared understanding of and shared commitment to the means.	Clinicians' ascribed value to IT expertise was perceived to be low as indicated by their level of engagement with the EHR demo and requirements documentation. This impacted the teams' ability to reach a shared understanding of and shared commitment to the means.

Table 14: CHP Project Findings

Shared understanding and shared commitment are essential for fostering effective team interactions in agile distributed ISD project teams, and ensuring that individuals are aligned during their engagement with project work, milestones, and deliverables (Conklin, 2005; Hummel, Rosenkranz, & Holten, 2016). However, findings from the case study suggests that, contrary to existing literature, shared understanding is not necessarily a precursor to shared commitment in agile distributed ISD projects. In particular, shared commitment to the vision, approach, and means may not arise, even where shared understanding is relatively well established. Despite the gradual emergence of shared understanding among the agile distributed ISD team in the case study, a shared commitment to the vision, approach, and means did not come to pass. Technologists struggled to foster shared commitment among other team members and consequently, they remained isolated in their dedicated commitment to utilise resources in the pursuit of goals.

However, one interesting finding was that certain periods characterised by a lack of shared understanding turned out to be constructive to team performance later on. These team interactions allowed team members the opportunity to contribute divergent knowledge flows which challenged assumptions around the agile distributed ISD project and prevented team members in becoming attached to preconceived viewpoints too early. Team members were able to then work towards clarifying these diverse knowledge flows into their collective knowledge, eventually improving shared understanding around the properties, concepts, and implications of the agile distributed ISD project. While moving from shared understanding to shared commitment may seem like a sequential process, the findings suggest that it is in fact more chaotic and dynamic as team members must continuously alternate between periods of cohesion and conflict. During these cycles, participants engage in conflict around the vision, approach, and means while identifying couplings that 'hang together' in order to generate cohesion (cf. Farrell & Hooker, 2013; Simon, 1973).

For instance, the project manager in the CHP project organised Joint Application Development (JAD) workshops to help foster constructive conflict among clinicians and technologists in relation to the overall project vision. During the kick-off phase, the project manager and analyst met to plan and discuss a series of JAD workshops aimed at building a collective project vision. In particular, these workshops aimed to foster constructive conflict through the use of designed artefacts for overcoming disciplinary boundaries. As a result, prototypes, patient journey maps, personas, and storytelling were used to increase shared understanding between technologists and clinicians in relation to the key touch points between the expectant mother, connected health platform, and the healthcare system. The designed artefacts were continuously iterated based on feedback from the distributed team which in turn helped promote increased levels of shared understanding over time. The project manager perceived these artefacts to be effective interventions for fostering shared understanding and shared commitment between technologists and clinicians early in the project.

The designation of this ‘incubation period’ at the start of the project also proved invaluable in providing a safe environment for the technologists to foster both cohesion and conflict during the agile distributed ISD project. For instance, the technologists dedicated the first two months of the project to exploration, the conduction of a state of the art review, and the study of clinical guidelines. In particular, the incubation period helped technologists to engage in conflict around the vision, approach, and means and allowed them to explore the use of open source solutions and hypothesise eventualities around the use cases of the connected health platform in terms of the contexts in which it would be deployed.

However, shared commitment still proved more difficult to realise as some team members were hesitant to commit time, effort, and resources towards proposals that had gained shared understanding. Attempts to structure and assign tasks to team members proved challenging as a result given the high levels of contention, complexity, uncertainty, and value judgements present during team interactions. While the project manager played a key part in building a vision of “what was best for the project”, the lack of shared commitment impeded the estimation of person-days associated with project work and descriptions of work. As a result, despite the looming deadline for completion of the connected health platform, the clinicians, and other team members such as the IT start-up company were reluctant to commit to a timeline for delivery. These findings therefore suggest that the unique features of agile distributed ISD projects often do not easily lend themselves to mitigation through structured project planning; instead, project managers must continuously engage the team in dialogue and argumentation in order to gain insights into the interplay between macro-level factors, micro-level factors, and team interactions.

6.7. Concluding Remarks

In this paper, we explored team interactions in the context of agile distributed ISD projects to investigate how team members reach a shared understanding and shared commitment. The empirical findings describe how structure, identity, and culture impeded shared understanding and shared commitment among technologists and clinicians in the project team. For instance, insights derived from the case study suggest how shared understanding and shared commitment among the team can be impeded by differences in structures, identities, and cultures around the vision, approach, and means. Nevertheless, the discussion presented also points to preliminary evidence of how periods of constructive conflict among the team can be beneficial for clarifying sources of differences. For instance, despite the inherent challenges faced in practice, the PI and clinical lead have since evaluated the project as a success, and the connected platform went live within time and budget for the conduction of the research study. This success has been credited to the time and effort invested by members of the team and the interventions designed by the project manager and analyst to embed both cohesion and conflict into team interactions.

The empirical findings and resulting theoretical framework presented in this paper can help deepen scholars' understanding of agile distributed ISD projects. This theoretical contribution has implications for the management and research of agile distributed ISD projects going forward by showing how the interplay between macro-level factors, micro-level factors and team interactions can affect shared understanding and shared commitment. As illustrated by the findings from the case study, reconciling the divergent perspectives of team members in agile distributed ISD projects is a complex evolving journey with multiple dimensions, which in turn affects how project objectives are pursued. When dealing with agile distributed ISD projects there is an added complexity, uncertainty, and contention in that it is not just the understanding of the problem-space that is at stake, but also the vision, approach, and means by which the problem will be addressed.

However, to date existing literature provides little support to the scholars grappling with these journeys. This paper takes initial steps towards addressing this gap in literature; however, further research is needed to investigate the nature of agile distributed ISD team interactions in more detail and further explore the implications of this area for project management and research. Future research studies can aim to investigate initiatives that can help promote shared understanding and commitment in agile distributed ISD projects, such as JAD workshops, patient journey maps, prototyping and storytelling. In addition, future research might seek to study the tension between cohesion and conflict in agile distributed ISD projects. The findings presented in this paper suggest that both cohesion and conflict are essential to the conduct of agile distributed ISD projects, particularly in environments characterised by complexity and contention. This merits further attention as it runs contrary to a large body of existing literature which assumes that cohesion is the sole objective of distributed ISD project teams.

Postface to Chapter

Building on the conclusion to this chapter, the next chapter seeks to investigate the relationship between cohesion, conflict, and team performance in distributed ISD project teams characterised by wickedness. While existing literature primarily asserts that cohesion is the main objective of team interactions in distributed ISD project teams, findings from this chapter suggest a more complex relationship. Chapter 7 will therefore seek to provide a more refined and expanded discussion on how the interplay of macro- and micro-level factors affect team interactions in term of cohesion and conflict.

It should also be noted that while discussion around wickedness are less explicit in chapter 7-9, wickedness is nevertheless retained as a guiding concept for understanding the contextual background of the case studies analysed in the proceeding chapters.

Chapter 7: Theorising Antecedents of Cohesion and Conflict in Distributed ISD Project Teams[4]

Preface to Chapter

Chapter 7 seeks to investigate the following research question: *What is the relationship between cohesion, conflict, and team performance?* In particular, the chapter builds on findings from the previous chapter to exam both *cohesion* and *conflict* in distributed ISD team interactions. Chapter 7 also applies the evolving theoretical framework to a second case study. The Athena project is used as a setting for investigating RQ3 and sets out to examine how the distributed ISD project team came to terms with the tension between cohesion and conflict during team interactions. The application of the theoretical framework to a second case provided opportunities for gathering potentially frame-breaking insights which helped strengthen the validity of the dissertation's theoretical contributions (Eisenhardt, 1989).

Chapter 7 also presents the third iteration of the theoretical framework which begins to consider the tension between both cohesion and conflict in distributed ISD project teams. This iteration of the theoretical framework recognises that cohesion does not fully encapsulate team performance in distributed ISD projects, and conflict must also be considered in order to gain a deeper appreciation of how team members interact. Again, the third iteration of the theoretical framework draws on the macro-level and micro-level factors outlined by Parsons and Bourdieu.

[4] This chapter is based on a paper published in the proceedings of the 2018 International Conference on Information Systems (ICIS), San Francisco, USA, December 2018.

Abstract

The effectiveness of distributed ISD teams is often inhibited by tensions between contextual (macro) and localised (micro) factors. In light of these challenges, literature suggests that cohesion is a key determinant of team performance; however, competing literature asserts that conflict is essential for exploiting diverse knowledge. This suggests a paradoxical need for both cohesion and conflict. However, existing ISD literature has yet to explore how the interplay of macro- and micro-level factors affect cohesion and conflict in distributed settings. To address this gap, we present and utilise a theoretical framework to analyse ethnographic data from a distributed ISD project called 'Athena'. The findings point to a 'double edged sword' of cohesion and suggest that moderate levels of task-based conflict are essential for addressing diversity in distributed teams. Additionally, excessive levels of cohesion can contribute to social conflict between subgroups when task conflict is constrained.

7.1. Introduction

Information System Development (ISD) projects are essential for organizations to remain competitive in the digital age. However, the management of ISD projects is far from a straightforward task. Despite the growing body of knowledge around the critical success factors of ISD project management, the rate of project failure continues to remain stubbornly high (Lim, Sia, & Yeow, 2011; Standish Group, 2015). Increasingly, social aspects of systems development are seen as a key determiner of performance differences among ISD project teams (Kotlarsky & Oshri, 2005; Luna-Reyes, Zhang, Gil-García, & Cresswell, 2005). For instance, ISD team performance can potentially be hampered due to a lack of team cohesion, and social conflict between groups (Carte & Chidambaram, 2004). Our ability to understand the social aspects of complexity in group decision-making is therefore essential for improving team performance during the conduct of ISD.

Social aspects of complexity in group decision making are particularly ripe in ISD projects undertaken in distributed settings (Kotlarsky & Oshri, 2005; Windeler, Maruping, Robert, & Riemenschneider, 2015). Distributed ISD projects refer to ISD practices in which team members are organizationally, geographically, or temporally dispersed (Kudaravalli & Faraj, 2011). The creation of clear and agreed IT solutions is often inhibited in distributed ISD project teams due to tensions between the contextual (i.e. macro-level) and localised (i.e. micro-level) factors that shape social interactions (McCarthy, O'Raghallaigh, Fitzgerald, & Adam, 2018a; Sarker & Sahay, 2003). For instance, conflict can emerge due to contextual differences between the positions, interests, and values of individuals and groups which in turn shapes their localised social interactions during the development of an IT artefact. In light of these challenges, literature suggests that cohesion is a key determinant for the performance of distributed project teams (Garrison, Wakefield, Xu, & Kim, 2010; Hummel, Rosenkranz, & Holten, 2016; Venkatesh & Windeler, 2012). However, competing literature equally asserts that task conflict is essential for team performance in order to capitalise on diverse knowledge flows around the problem and IT solution coupling (McAvoy & Butler, 2009; X. Yang, Tong, & Teo, 2015).

Project managers must therefore balance the seemingly paradoxical need for both cohesion and conflict in order to drive higher levels of team performance in distributed settings. According to Fairhurst, Smith, Banghart, Lewis, Putnam et al. (2016), such paradoxes require new theoretical lenses which allow researchers to both 'zoom in and zoom out' from the localised micro-level and the contextual macro-level factors in order to better understand the locus of paradoxical tensions. In particular, Fairhurst et al. (2016) assert that the interplay between macro- and micro-level factors can provide insights into how paradoxes emerge, change, and reproduce. For instance, the emergence of paradoxes such as cohesion and conflict can be understood by investigating the interplay between micro-level processes of organising among individuals, and the large scale macro-level patterns which change and reproduce paradoxes over time. However, existing ISD literature to date has yet to explore the interplay of these macro- and micro-level factors and its impact on ISD project team cohesion and conflict in distributed settings.

This paper seeks to fill the gap in literature by exploring the interplay of factors which impact cohesion and conflict in distributed ISD project teams. Specifically, we seek to address the following research question: *How does the interplay between macro- and micro-level factors affect cohesion and conflict in distributed ISD project teams?* An in-depth investigation of this research question will be essential for deepening our understanding around the drivers of cohesion and conflict in increasingly distributed ISD environments. We present empirical findings from the 15-month case study of a collaborative academic-industry ISD project called 'Athena', and utilise a theoretical framework to describe and explain interactions among the team members.

The remainder of the paper is structured as follows: Section 2 provides a literature review of cohesion, and conflict in distributed ISD projects, while Section 3 introduces the research design behind our case study. Section 4 outlines the theoretical framework of the paper and Section 5 presents the findings from the case study. Section 6 discusses the findings as relevant to academic and practitioner communities, before Section 7 brings the paper to a close with a conclusion.

7.2. Literature Review

7.2.1. Distributed ISD Projects

ISD practices are increasingly conducted by distributed project teams consisting of individuals from different organizational, geographic, and disciplinary backgrounds (Garrison, Wakefield, Xu, & Kim, 2010; Kotlarsky & Oshri, 2005; Powell, Piccoli, & Ives, 2004). Distributed ISD is made possible by the availability of sophisticated IT solutions (e.g. email, video conferencing, and groupware) which allow ISD project teams to collaborate across temporal, spatial, and organizational boundaries with relative ease. The conduct of distributed ISD practice has become increasingly prevalent in recent times as it enables organizations to expand their pool of development resources, and pursue a ‘follow the sun’ development model whereby the number of daily working hours is increased by locating team members across different time-zones (Conchúir, Ågerfalk, Olsson, & Fitzgerald, 2009; Sarker & Sahay, 2004). For instance, it is proposed that distributed ISD practice can allow organizations to decrease their cycle time of development by integrating the clock time of different countries (Sarker & Sahay, 2004). This model of development would not be feasible for traditional co-located teams where individuals are situated in the same physical location (Jarvenpaa, Shaw, & Staples, 2004; Powell, Piccoli, & Ives, 2004).

However, despite these proposed benefits, existing literature suggests that social complexity (cf. Conklin, 2005) is ripe in distributed project teams as individuals face inherent challenges around collaboration, learning, and the management of knowledge (Carte & Chidambaram, 2004; Windeler, Maruping, Robert, & Riemenschneider, 2015). For instance, Garrison, Wakefield, Xu, and Kim (2010) find that the inherent diversity characteristics of distributed ISD teams can have a negative impact on perceptions of group cohesion, trust, and performance. Team diversity can also result in the emergence of subgroups within the wider project team. For instance, subgroups can emerge due to perceived differences between the professional background, organizational affiliation, or demographic of team members (Pflügler, Wiesche, & Krcmar, 2018; Van Knippenberg & Schippers, 2007b). Subgroup members have a tendency to engage more frequently in face-to-face communication with members within the subgroup than with those considered outsiders, which in turn can create social complexity due to the emergence of competing goals (Aggarwal, 2014; Van Knippenberg & Schippers, 2007b). A number of factors have been found to contribute towards the emergence of subgroups including: diversity of positions, interests, cultural meanings and values (Aggarwal, 2014; Carton & Cummings, 2012; Kleinsmann & Valkenburg, 2008).

In light of these challenges, it is therefore not surprising that the rate of ISD project failures continues to remain stubbornly high (Lim, Sia, & Yeow, 2011; Standish Group, 2015). While prior literature had initially conceptualised ISD as primarily a technical endeavour, there is now a growing awareness of how social aspects of the ISD process affect team performance and project success (Doherty & King, 2005; Kotlarsky & Oshri, 2005). For instance, some IS scholars go so far as to suggest that ISD practice primarily concerns the social construction of knowledge, where individuals and groups seek to collaboratively build new understanding around the development of a system (J. Lee, Park, & Lee, 2015; Luna-Reyes, Zhang, Gil-García, & Cresswell, 2005; Sawyer, Guinan, & Cooprider, 2010). In order to address social aspects of complexity, team members continuously interact to share ideas, resolve conflict, and coordinate resources and the flow of information (Lim, Sia, & Yeow, 2011; Sawyer, Guinan, & Cooprider, 2010). However, our understanding of the social aspects of systems development in distributed settings still remains nascent. In particular, findings from Windeler, Maruping, Robert, and Riemenschneider (2015) points towards the need to further research around the relationship between cohesion and conflict in distributed ISD teams. While authors such as Garrison, Wakefield, Xu, and Kim (2010) and Barki and Hartwick (2001) have previously looked at cohesion or conflict in isolation, there is a dearth of ISD literature investigating the paradoxical tension between both cohesion and conflict in distributed ISD projects.

7.2.2. Team Cohesion

Team cohesion has been found to have a positive impact on team performance and collaboration in distributed team environments (McAvoy & Butler, 2009; Venkatesh & Windeler, 2012; X. Yang, Tong, & Teo, 2015). Literature distinguishes between two forms of team cohesion: 'social cohesion' which refers to the interpersonal attraction between members of a group in terms of their values, identities, and norms (Windeler, Maruping, Robert, & Riemenschneider, 2015), and 'task cohesion' which refers to individuals' engagement with the team in terms of the divisions of resources, and procedures for completing tasks (X. Yang, Tong, & Teo, 2015). Team cohesion is particularly crucial in order to help reconcile the different perspectives of distributed team members from different organizational, cultural and disciplinary backgrounds (Garrison, Wakefield, Xu, & Kim, 2010). Team cohesion can help strengthen communication lines between team members, the level of task participation, and improve collaboration efforts around the accomplishment of a task; in addition, team cohesion can help teams better utilise the resources available to team members while working towards the completion of tasks (cf. X. Yang, Tong, & Teo, 2015). Conklin (2005) argues that the process of formulating a problem contributes to higher levels of cohesiveness around potential solutions, and likewise cohesiveness around the problem-space is refined through the formulation of potential solutions. However, achieving team cohesion requires individuals to bridge differences in positions, interests, and cultural meanings through a dialogical approach and align their utilisation of resources towards the achievement of a defined task.

Team cohesion can be defined as the extent to which team members are aligned in their shared understanding of and shared commitment to project tasks i.e. the actions that individuals and groups seek to perform based on an agreed plan (McCarthy, O'Raghallaigh, Fitzgerald, & Adam, 2018b; Thatcher & Patel, 2011; X. Yang, Tong, & Teo, 2015). Conklin (2005) asserts that the cohesiveness of work groups is dependent on both the level of shared understanding and shared commitment, and the willingness of individuals to engage in dialogue around inherent differences around their perspectives, understandings, and intentions. Firstly, shared understanding refers to the social process whereby the divergent perspectives of individual team members is transformed to generate collaborative knowledge building and enhanced team performance (Kleinsmann & Valkenburg, 2008; Puntambekar, 2006). Shared understanding does not necessarily imply that everyone shares exactly the same viewpoint but instead requires that team members recognise differences in interpretations and work towards collaborative knowledge building. However, shared understanding alone is not enough, and shared commitment is equally required for team cohesion to ensure that solutions can be effectively delivered. Shared commitment goes beyond the transfer of information and knowledge, and requires the commitment of time, effort, and resources by interdisciplinary team members in line with proposals that have gained shared understanding (Briggs, Kolfschoten, & Vreede, 2005; Conklin, 2005; X. Yang, Tong, & Teo, 2015).

7.2.3. Team Conflict

Conflict has also been identified as an inherent feature of distributed ISD teams (O'Leary & Mortensen, 2010; Windeler, Maruping, Robert, & Riemenschneider, 2015). Conflict can be defined as the extent to which team members diverge in their shared understanding of and shared commitment to project tasks (Carte & Chidambaram, 2004; Van den Bossche, Gijselaers, Segers, Woltjer, & Kirschner, 2011). Literature suggests that the impact of conflict on team effectiveness varies according to whether conflict is task-based or social in nature (Carte & Chidambaram, 2004; Windeler, Maruping, Robert, & Riemenschneider, 2015). Task conflict (also known as constructive conflict) is generally seen as beneficial in moderation as it allows individuals to voice underlying divergences between their perspectives and interpretations of tasks through argumentation and clarification (Robey, Smith, & Vijayasarathy, 1993; Van den Bossche, Gijselaers, Segers, Woltjer, & Kirschner, 2011). While team cohesion is recognised as an important determinant of team performance, McAvoy and Butler (2009) suggest that excessive levels of cohesion can impede the performance of agile software development project teams, above all when the drive for consensus suppresses disagreement and the appraisal of alternatives. Task conflict aims to challenge team members' pre-existing assumptions and dispositions. In addition, task conflict can also foster creativity where specialists from diverse disciplinary and organizational backgrounds seek to capitalise on divergent knowledge flows and overcome the knowledge gap of any one individual.

In contrast, social conflict is generally seen to have a negative impact on team performance (Kankanhalli, Tan, & Wei, 2006; Windeler, Maruping, Robert, & Riemenschneider, 2015). For instance, literature on social conflict (commonly referred to as destructive conflict) suggests that excessive levels of social conflict can impede team performance where it breeds negative feelings and resentment between team members (Carte & Chidambaram, 2004; Montoya-Weiss, Massey, & Song, 2001). Team members from distributed professional and organizational backgrounds typically come with a multitude of different perspectives, ideas, and knowledge which can make collaboration difficult. For instance, McCarthy, O'Raghallaigh, Fitzgerald, and Adam (2018a) point towards the emergence of destructive conflict in a distributed ISD project team consisting of participants from numerous disciplinary backgrounds including developers, an analyst, a project manager, and healthcare practitioners. Chidambaram, Bostrom, and Wynne (1990) assert that while conflict is essential to group development, team effectiveness hinges on dealing with conflict productively while still maintaining a divergence of opinions. However, there remains a dearth of literature on the relationship between cohesion and conflict in distributed ISD project teams.

The next section provides an outline of the research design of the case study.

7.3. Research Design

An in-depth case study approach was chosen to study the information-rich case of a distributed ISD project called "Athena". This was selected as the most appropriate research design as it allowed the lead author to exploit his unique position as a full-time member of the project team. The author was in turn able to gain first-hand insights into the plurality of motivations, intentions, and understandings of individuals, and create 'thick descriptions' of the cultural context by building empathy with subjects. The project in question was a collaborative effort between an insurance company, and IS research centre based within a national university. The funding structure consisted of 20% cash and 15% benefit-in-kind contribution from the insurance company, and 65% cash contribution from a national funding body. The national funding programme aimed to stimulate the development of new knowledge, products, processes, and services by encouraging collaboration between research centres and companies with a national operating base. At the time of this study, national universities were under increasing pressure to secure financial contributions from industry in order to support the sustainability of their research centres. The public funding model for the research had become increasingly constrained following the economic recession, and as a result, the 'co-fund' scenario had become increasingly commonplace. Academic and industry collaboration projects in the IT sector were particularly prevalent at the time due to the numerous co-funding opportunities available. The co-fund model stipulated that the academic partner would generate research publications from the project while the industry partner would develop a commercialisation plan.

The project task and remit of the funding scheme sought to develop "mutually beneficial" outcomes for both partners. This included the development of IT solutions which would allow the insurance company to remotely deliver technology-enabled services in a foreign market; for instance, the team sought to develop technologies which would support offshore claims processing, and IT enabled insurance services for ex-patriates. In addition, the academic partner was expected to publish research findings in academic journals and conferences; the project proposal noted that the IS research centre would accumulate knowledge which could serve the basis of teaching material in the form of case studies and research output in the form of leading edge publications. The project team was distributed across different geographic locations and organizational settings; team members utilised ICT solutions such as email, conference calls, and file sharing platforms to collaborate, share knowledge, and communicate during the duration of the project. In addition, face-to-face meetings were scheduled on an intermittent basis and attended by all team members.

7.3.1. Data Collection and Data Analysis

The case study focuses on the longitudinal 15-month timeframe, between September 2013 and December 2014, during which time the lead author was an active member of the project team and was present in the field for five days a week, eight hours a day, from Monday to Friday. Data from the case study was triangulated from three different sources to increase the robustness of findings: direct observations, interviews, and project documents (Miles &

Huberman, 1994). Participant observations were recorded in field notes by the lead author. This data was complemented by five semi-structured interviews with members of the team between August 2017 and October 2017: The Principal Investigator (PI), co-PI, analyst, innovation lead, and project manager, with each interview lasting between 45 and 60 minutes. The interviews were recorded and then transcribed. Finally, project documents, meeting minutes, and emails between team members were used to unearth further insights. Our analysis focused on the actions and interactions between team members and technological objects within the field of practice (cf. Bourdieu, 1977; Faulkner & Runde, 2013). The field of practice refers to the situated and temporal nexus of action where individuals interact and engage in discussions, negotiations, and conflicts around a technological object.

The authors developed an evolving conceptual framework which set out the initial research themes; these themes were then iteratively reviewed and refined during the research process through reflection and analysis of collected data (cf. Carroll & Swatman, 2000). The lead author analysed case study data using two primary techniques: coding and vignettes. Open, axial, and selective coding, as per Strauss and Corbin (1990) and Miles and Huberman (1994), were used to analyse the transcribed interview data. Open coding was used by the lead author to identify new concepts related to team cohesion and conflict, and their associated properties and dimensions. Axial coding was then used to form relationships between codes through inductive and deductive reasoning. Finally, selective coding involved the adoption of a core category to form a storyline around the research. Vignettes as per Miles and Huberman (1994) were also used to produce, reflect on, and learn from participant observation data, and were analytically subdivided based on temporal (i.e. project phases) and spatial (i.e. venues) dimensions (Miles & Huberman, 1994). In addition, the lead author met weekly with the second author to recount his observations and make sense of the findings. During these meetings, which typically lasted between one and two hours, the second author would ask the lead author a series of questions about the data in order to extract potentially relevant themes. These interactions helped guide the lead author's ongoing analysis.

The next section outlines the theoretical framework of the paper.

7.4. Theoretical Framework

In order to investigate the aforementioned research question, the authors developed a theoretical framework which aims to assist in describing and explaining how the interplay between macro-level and micro-level factors impacts cohesion and conflict in distributed ISD project teams. Macro-level factors relate to those large-scale social patterns and trends which shape individual behaviours, whereas micro-level factors concern the study of social interactions among individuals in the field (McCarthy, O'Raghallaigh, Fitzgerald, & Adam, 2018a; Sarker & Sahay, 2003). The term interplay then refers to the reciprocal relationship between the two dimensions which exist at different levels of analysis i.e. macro and micro (Bélanger, Cefaratti, Carte, & Markham, 2014). Theory building was undertaken following the structured-case approach (cf. Carroll & Swatman, 2000, pg. 236) which consists of "constructing and articulating a preliminary conceptual structure, collecting and analysing data, and reflecting on the outcomes to build knowledge and theory". Our theoretical development therefore takes the form of a framework which is grounded in empirical findings from the case presented in this paper and existing literature, including the seminal works of Parsons (1951, 1964) and Bourdieu (1977, 1990).

The theoretical framework aims to provide novel insights into how the interplay between macro- and micro-level factors shape the conduct of the distributed ISD projects, and in turn how this interplay impacts cohesion and conflict. Studying this interplay helps us to understand how micro-level interactions create patterns which eventually become established as macro-level constructs over time, and how these macro-level constructs in turn then shape and constrain human action at the micro-level. Following Latour (2007), we challenge prior conceptualisations of the social world as something constant and absolute, and instead assert that the social world is constantly in flux based on the continuous interplay between the macro-level context and micro-level social interactions. Therefore, the insights provided by our framework overcomes the limitations of a strict 'dualist perspective' which investigates the macro- or micro-level in isolation.

Building on the works on Parsons (1951, 1964), our framework looks at interactions among individuals through the lens of three macro-level factors: Structure, Identity, and Culture, each of which can relate to different groups such as a subgroup within the project team, the wider project team, or the organization in which a team member belongs to. Structure, Identity, and Culture are contextual aspects related to the environmental context, and team characteristics which tend to persist (cf. Sarker & Sahay, 2003). Structure deals with the different positions, roles, and rules which shape how team members take action to pursue goals across situations. Identity meanwhile deals with the different interests of team members which motivate their engagement in situations and courses of action. Finally, Culture refers to the different shared meanings, values, and assumptions which are internalised by team members over time.

Our review of literature on distributed ISD project teams also points to the relevancy of these three macro-level factors. For instance, Sarker and Sahay (2003) have previously suggested that structure effects the degree of dependency, control and intimacy between the members of a distributed ISD team. Carter and Grover (2015) have suggested that an individual's identity is often intertwined with IT artefacts and technology can become central to how individuals express, maintain, and expand self-concepts. Meanwhile, Kankanhalli, Tan, and Wei (2006) assert that cultural diversity in distributed ISD teams can contribute to higher levels of task conflict which in turn can improve team performance, specifically in relation to complex tasks.

Building on the works of Bourdieu (1977, 1990), we next turn attention towards the localised micro-level factors which shape social interactions among individuals: Vision, Approach, and Means, each of which can relate to different groups such as a subgroup within the project team, the wider project team, or the organization in which a team member belongs to. The construct of Vision deals with the intended course of action which will be pursued by individuals in the field of practice, and which in turn shapes their decisions and utilisation of resources in the field. Approach refers to the 'modus operandi' of how individuals achieve goals which is guided by the tacit knowledge acquired through their accumulated experience in practice (Bourdieu, 1990; Nettleton, Burrows, & Watt, 2008). Means refers to the resources or forms of capital which are utilised by individuals to pursue goals in the field.

Table 1 combines the insights of Parsons and Bourdieu to investigate how the interplay between macro-level and micro-level factors impacts cohesion and conflict between subgroup members. We view the works of Parsons and Bourdieu as complementary. Bourdieu (1977) makes direct reference to the works of Parsons when describing how the perceived dualism between macro-level and micro-level can be reconciled. Our theoretical framework builds on this insight to gain insights into how differences in structure, identity, and culture interplay with the vision, approaches, and means of subgroups in the arena of localised practice.

	Structure	*Identity*	*Culture*
Vision	Examines how the interplay of structure (e.g. team hierarchy) and vision (e.g. IT development) impacts cohesion and conflict between subgroup members.	Examines how the interplay of identity (e.g. interests) and vision (e.g. IT development) impacts cohesion and conflict between subgroup members.	Examines how the interplay of culture (e.g. assumptions) and vision (e.g. IT development) impacts cohesion and conflict between subgroup members.
Approaches	Examines how the interplay of structure (e.g. team hierarchies) and approaches (e.g. project planning) impacts cohesion and conflict between subgroup members.	Examines how the interplay of identity (e.g. interests) and approaches (e.g. project planning) impacts cohesion and conflict between subgroup members.	Examines how the interplay of culture (e.g. assumptions) and approaches (e.g. project planning) impacts cohesion and conflict between subgroup members.
Means	Examines how the interplay of structure (e.g. team hierarchies) and means (e.g. team capabilities) impacts cohesion and conflict between subgroup members.	Examines how the interplay of identity (e.g. interests) and means (e.g. team capabilities) impacts cohesion and conflict between subgroup members.	Examines how the interplay of culture (e.g. assumptions) and means (e.g. team capabilities) impacts cohesion and conflict between subgroup members.

Table 15. The Typology for Organizational ISD Practice (Version 3)

The conceptual diagram is shown in Figure 9 and illustrates the interplay between macro-level factors (Structure, Identity, and Culture), and micro-level factors (Vision, Approaches, and Means). Pragmatically, the interplay between these two dimensions represents how collective patterns (macro-level) influences the individual interactions (micro-level) and vice versa during the conduct of ISD. Thanks to the insight explicating this provides, we were able to better explain cohesion and conflict in distributed ISD teams.

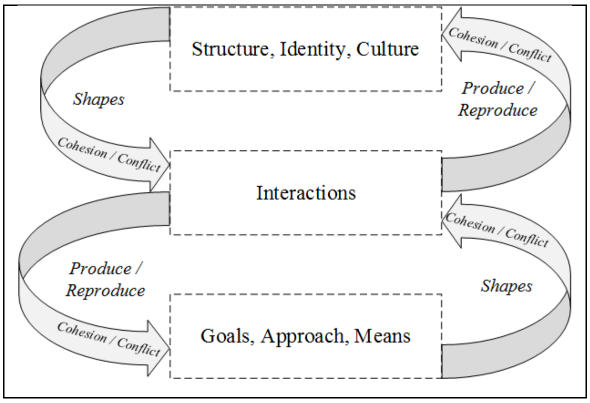

Figure 9. Conceptual Diagram (Version 2)

The next section outlines findings from the case study.

7.5. Findings

The distributed ISD project team consisted of individuals from multiple organizational and disciplinary backgrounds including insurance professionals in a national insurance company, and academic and research staff in an Information Systems (IS) research centre. Two subgroups emerged through participant observations and interviews with members of the project team: the 'industry subgroup' which consisted of an actuary, innovation lead, and project manager in the insurance company, and 'IS subgroup' which consisted of a Principal Investigator (PI), co-PI, User Experience (UX) developer, and three analysts in the IS research centre.

The remainder of this section outlines how the interplay between the macro- and micro-level factors impacted team cohesion and conflict. Each cell of the theoretical framework is used to examine a different manifestation of this interplay and how it shaped group development in the Athena project. The remaining subsections are grouped by macro-level factors (i.e. Structure, Identity, Culture), and their interplay with each micro-level factor (i.e. Vision, Approaches, Means) in turn. This grouping choice was arbitrary and does not denote the relative importance of either macro- or micro-level factors.

7.5.1. The Interplay between Structure and Micro-Level Factors

Emerging Hierarchies and Vision in the Project Team (Structure – Vision)

The interplay between structure and vision: While the PI and innovation lead were initially at the apex of the project team's hierarchical structure, the actuary quickly assumed the de-facto role of primary decision maker following his assignment to the team. As a result, the actuary began to override previous vision set by the PI and innovation lead during team interactions. For instance, the actuary utilised meetings between the distributed team as a way to challenge the initial hierarchy and changed the project's vision considerably to include a number of new technological areas which the IS subgroup would need to investigate. As stated by one analyst: "*he would have cleared stuff off the board as a non-runner pretty quickly without even having a detailed look at the topic… he was able to very quickly say that 'yes that's a potential runner', or 'no that's way beyond what we can do"*. The actuary began to increasingly structure the work that the IS subgroup should undertake. In order to maintain a good relationship with the insurance company, the PI and co-PI agreed to follow the emerging vision set out by the industry subgroup, and instructed the analysts and UX developer to meet their demands.

The impact of this interplay on cohesion and conflict: While the actuary's de-facto role helped generate cohesion around the commercially-oriented vision of the insurance company, it limited the IS subgroup's ability to engage in task conflict and pursue academic-oriented vision which were of primary relevance to the IS subgroup. For instance, the resulting project plan developed by the project manager did not make reference to the delivery of any academic outputs by the IS subgroup such as publications and consequently, the IS subgroup found it difficult to discern potential academic contributions at the end of the project. The co-PI later acknowledged that the IS subgroup were constrained in their ability to realise mutually beneficial outcomes as the insurance company primarily stood to benefit from the project plan: "*we don't bring heavy hitting theory to these types of projects, we bring a lot of common sense and know-how in terms of how to manage* *good relationships with our funders… and making sure that there is a meaningful outcome. And that may not necessarily be an academic output”*.

Tension in the Project Management Relationship (Structure – Approaches)

The interplay between structure and approaches: It became clear to the IS subgroup early in the project that the industry subgroup wished to pursue a very structured ‘top down’ approach to project management which included tightly controlled task allocations with hard deadlines for completion. In contrast, the IS subgroup were more accustomed to a loosely structured ‘bottom up’ approach in which the analysts and UX developer were conferred with more autonomy over their task allocations. However, the IS subgroup’s bottom up approach made the industry subgroup uneasy as they perceived inherent risks associated with this approach. As stated by the innovation lead: “*the resources that we have assigned here internally to work on (Athena) is a cost to the business… we need structure; from a research perspective, maybe a loose plan, but still a plan*”. The project manager was therefore recruited to enact a top down approach to managing the distributed team and improve cohesiveness by coordinating the IS subgroup’s work through email and conference calls. Once recruited, the project manager set out to deliver a project plan in collaboration with the innovation lead which detailed a clear assignment of task allocations based on a set scope and timeline.

The impact of this interplay on cohesion and conflict: This structured top down approach later led to social conflict as the IS subgroup felt that the project manager did not fully appreciate the inherent challenges that the IS subgroup faced in completing their allocated work. The IS subgroup became frustrated by the project manager’s repeated emails which demanded the completion of challenging work tasks. While the PI tried to push back on these demands on a number of occasions, tension in the project management relationship still remained. As stated by the co-PI: “*(the project manager) didn’t understand or really appreciate that research and development can be a bit vague at times. The outcome may not always be expected and that living with a little bit of uncertainty in research is what we do every day*”. In particular, the analysts encountered uncertainties around the research scope given that exploration was a key part of the original approach detailed in the proposal. The analyst commented on the uncertainties that the IS subgroup faced in defining the scope of research: "*I guess the nature of research is not something that you can necessarily tie down tight… (but) they ran a very tight ship when it came to project management which would have been relatively newer for us*".

Structural Changes to Team Capabilities (Structure – Means)

The interplay between structure and means: Structural changes to the team were made over time, with new team members brought in to expand the means available within the Athena project. For instance, the project manager was recruited a few months into the project to work full-time on Athena and closely monitor the work of the distributed team. The decision was surprising as the co-PI had already assumed the role of project manager in the IS research centre, and in effect created two project management roles. As stated by the insurance company's project manager: "*My role was to be the project manager from the insurance company's side and so I would be liaising with the team in the IS research centre on a regular basis. The IS research centre obviously had their own project manager so I would be liaising with her as well*". On paper, the co-PI seemed better suited to assume the responsibility of monitoring the IS subgroup's work as the project manager had limited experience of managing ISD projects or research teams. Nevertheless, the industry subgroup felt the project manager's skills in project management would help generate cohesion around the means of practice and ensure that the IS subgroup's capabilities would be better employed for the duration of the project. Following this structural change, the co-PI gradually stepped away from project management responsibilities as it was no longer seen as necessary.

The impact of this interplay on cohesion and conflict: The assignment of two team members with project management responsibilities eventually led to social conflict as structural reporting relationships between the project manager, the analyst and UX developer had not been formally defined. The project manager had hoped that the IS subgroup would report directly to her and the co-PI by email on all project matters as a first port of call; however, in practice the UX developer and analysts reported to the co-PI first and felt less of an obligation to communicate with the project manager once the co-PI's clearance had been given. Moreover, this restructuring of the team may have pointed towards a lack of task cohesion and trust in the IS subgroup's capabilities to deliver on the project proposal unaided. Issues of trust in the team's capabilities seemed to develop from the industry subgroup's perception that the IS subgroup, while highly competent in developing prototype IT artefacts and assimilating data from field research, lacked the commercial knowledge to deliver real organizational change. The innovation lead commented that in the event that the two partners would collaborate again, she would envision a very lean scope of involvement for the IS research centre where: "*the research institute (would) take a more minor role… I think ye could play a role, but not to the extent of the role you played in (the Athena project)*"

7.5.2. The Interplay Between Identity and Micro-Level Factors

<u>Conflicting Professional Interests around Project Success Criteria (Identity – Vision)</u>

The interplay between identity and vision: At the end of the Athena project, the distributed ISD team achieved the goals of delivering outputs on time, within budget, and to the pre-defined project scope. However, team members still perceived success in different ways based on their identity-related interests. For instance, the PI asserted that the Athena project represented one of the most successful projects he had been part of, and noted his aspirational goal to engage in projects like Athena again in the future: "*Athena is really the architype of the kind of projects that I would like to be involved in… For me it remains a model for the kind of work I would like to do in the future*". This aligned with his professional interests in securing ample amounts of research funding and maintaining a strong relationship with the insurance company. Similarly, the project manager indicated that Athena had been successful based on standard project management KPIs having been met such as the delivery of outcomes on time, within budget, and to scope. This perception of success was tied to the interests and goals related to her professional identity as a project manager. However, other team members harboured different views on project success based on their conflicting professional identities and goals. In particular, the analysts and co-PI were primarily interested in research output, mainly in the form of journal and conference papers.

The impact of this interplay on cohesion and conflict: Social conflict arose as team members were not provided with a forum to voice alternative views on project success, and instead these differences remained implicit. In particular, social conflict later emerged due to differences between the professional identities and career goals of the distributed ISD team. For instance, the analysts stood to benefit most from learning the craft of writing academic papers and developing a publication track record. However, the publication of research was deferred as a comparatively less important goal during the Athena project in order to maintain a strong relationship with the insurance company. The co-PI noted that in the end, the project had not fully delivered on academic vision set out in the proposal around research output: "*Would I do (it again)? It's a tough one. For these kind of projects, you have to go into them recognising that there may not be a huge amount of academic, publishable output*".

<u>Differing Interests in Project Management Approach (Identity – Approaches)</u>

The interplay between identity and approaches: The industry subgroup was held personally accountable in the insurance company for the final project outcome which motivated their professional interest in micro-managing the IS subgroup's approach to work. The innovation lead and project manager sought to ring-fence the work that would be carried out by the IS subgroup through the creation of a detailed project plan and Gantt chart. This regimented approach to project management was seen as essential to generate cohesion and ensure that the insurance company would minimise risks associated with their financial contributions. As stated by the innovation lead: "*from a research perspective I might have struggled a bit with… trying to put a bit of structure around (the project) and figuring out what's the scope of the piece of work we're doing… Cause from a commercial perspective we can't run projects indefinitely".* The project manager similarly pointed towards the importance of project management as a safeguard to generate cohesiveness given the diverse backgrounds of team members. For instance, the project manager noted her interest in enacting an approach that tightly controlled all tasks undertaken by the distributed team using a protocol of detailed descriptions of work with hard deadlines for completion.

The impact of this interplay on cohesion and conflict: Nevertheless, social conflict began to emerge over time as the industry subgroup continued to push for cohesion despite underlying tensions with the IS subgroup's identity-related interests. For instance, unlike the industry subgroup, the IS subgroup were less concerned by perceived uncertainties around the project scope and timelines for the completion of project work. The IS subgroup were instead more interested in adopting a laissez-faire approach to project management which increased flexibility through short-term planning and ad hoc decision making. In particular, a laissez faire approach to project management was more compatible with the IS subgroup's collective interests in 'blue sky thinking' and the investigation of leading edge technologies. The PI alluded to this when commenting on the interests of the UX developer: "*he (wanted) to play this very disruptive role … (the insurance company) prided themselves to be able to accelerate to a six-month (software development) cycle. And he was laughing and said to them 'how about two weeks?'*". Social conflict emerged as the IS subgroup felt the industry subgroup's intolerance for uncertainty conflicted with their collective identity-related interest to engage in 'blue sky thinking'. However, while the innovation lead recognised this social conflict, she remained adamant that such an approach would not be appropriate in the Athena project given the commercial demands faced by the insurance company.

<u>Nomadic Identities within the Project Team (Identity – Means)</u>

The interplay between identity and means: Team members' professional identities at times did not align with their collective identity in the distributed team which in turn led to certain team members becoming more nomadic over time. In particular, the UX developer's identity in the project team seemed to be in conflict with his professional identity which eventually created uncertainty around the means. The UX developer was keen to personally maintain this autonomy and to differentiate himself from other team members in the IS research centre as he wished to pursue a career in industry going forward. For instance, the UX developer was the only member of the IS researcher subgroup that did not wish to adopt a IS research centre email account or acknowledge the centre in his email signature. Commenting on this, the PI noted that: "*first of all there is the individual and their preferences… I managed to have a narrative about him and about his role in the project which allowed people to relax about his contribution and take it in terms of what path he had to travel"*. As a result of this autonomy, the UX developer's professional based identity in the project became more nomadic and uncertain over time. For instance, midway through the project, the UX developer agreed with the PI to assume the associate role of "IT Technical Architect in Software Development" within the insurance company and relocate to an open plan office based on the insurance company's premises. This in turn altered the means of ISD practice in the Athena project and shaped the interactions between team members.

The impact of this interplay on cohesion and conflict: Following this transition, the analysts' level of interaction with the UX developer decreased significantly and cohesion suffered. Despite the interdependencies between their tasks, the analyst began to decouple their work from the UX developer due to uncertainties around the means available to the IS subgroup. The analysts increasingly saw the UX developer's professional identity as residing with the insurance company, and therefore they no longer reached out to him to request the completion of tasks. Nevertheless, the UX developer felt less sure-footed about his identity in the distributed team. While the PI and co-PI still expected the UX developer to fulfil obligations associated with the Athena project and IS research centre, the project manager also increasingly began to manage the UX developer as an internal resource and contacted him regularly by email to ask for updates on his work. This became a source of social conflict for the UX developer given his preference for autonomy. The UX developer struggled to integrate into the insurance company's IT team, yet despite this, the innovation lead felt that "*he wasn't a person that needed* *to be taken care of too closely*" as she felt that he could be trusted "*to get on with things himself*".

7.5.3. The Interplay Between Culture and Micro-Level factors

Clashing Assumptions Around Project Vision (Culture – Vision)

The interplay between culture and vision: The PI noted that the industry subgroup came with cultural assumptions around the ISD project's vision which did not always reflect the IS subgroup's view of reality. For instance, at the start of the project, the PI noted that the industry subgroup had expected the IS subgroup to conduct work more akin to management consultancy or market research, whereas the PI remained adamant that the IS subgroup would only engage in Research and Development (R&D) and innovation. As a result, the PI tried to generate cohesion by continually reiterating the IS subgroup's goals in the project, as the funding programme rules prohibited the conduction of market research and consultancy activities: "*it is true that at times I went out explaining what a research project was from an academic viewpoint and they tried to counter in terms of what a research project was from their viewpoint. Where actually what they were interested in was market research*". However, despite the PI's efforts, the industry subgroup's assumptions around the project vision still remained. For instance, the industry subgroup often emailed to request the completion of tasks that could be labelled as market research, such as the conduction of surveys to gather data on existing customers and an analysis of existing competitors in the market. While the PI and co-PI eventually conceded to survey a sample of customers to better inform the artefact design, they refused to provide market recommendations at the end of the project as requested by the industry subgroup.

The impact of this interplay on cohesion and conflict: As a result of this interplay, task conflict emerged around each partner's involvement in achieving project goals. One analyst conceded that while it proved difficult for the IS subgroup to achieve the vision, task conflict did help generate cohesion around the industry subgroup's values: "*at times it was little too* *much as it was something we weren't used to, (but) it did result in number one, the ability of the company to change their targets and number two for us to be in line with the targets. As I say you might look to cool it off a little bit*". Having said that, the level of task cohesion around mutually beneficial goals was still limited. This later led to social conflict between the IS subgroup and industry subgroup, as sometimes the industry subgroup demanded the completion of project work beyond the scope of the project proposal. Although not explicitly outlined in the Athena project proposal, the PI justified these demands based on the insurance company's financial contribution. This occasionally led to social conflict as the analysts did not share the PI's view.

Tension Between Subgroup Values and Approaches (Culture – Approaches)

The interplay between culture and approaches: The industry subgroup placed high cultural value on the conduct of field research to investigate the technical viability of IS prototypes. This required the analysts to undertake interviews and surveys with key stakeholders in the foreign market, such as potential users and experts. However, the terms of agreement were that the insurance company would remain as an anonymous partner throughout the conduction of field research, and the IS subgroup would maintain a signed non-disclosure agreement (NDA) which prevented the IS subgroup from revealing the insurance company's potential plans to launch IT solutions in the foreign market. In addition, the IS subgroup faced cultural pressures to abide by the university's ethical guidelines which aimed to ensure transparency and accountability in their research. The IS subgroup agreed with the industry subgroup that they would deliver only aggregated and anonymised findings to the industry subgroup in order to uphold ethical guidelines. Based on these agreements, the PI and co-PI were confident that their approach to field research was defensible from an ethical and NDA point of view and therefore they indicated that the IS subgroup should proceed to engage with stakeholders in the foreign market.

The impact of this interplay on cohesion and conflict: The industry subgroup indicated that field research should begin without delay and as a result, cohesion around the approach was prioritised to ensure that the IS subgroup could begin. However, misalignments between academic and commercial values and unanticipated risks around the approach soon emerged due to the absence of task conflict. For instance, the stakeholders contacted by the IS subgroup increasingly demanded to know the name of the industry partner involved in the project which put pressure on the IS subgroup to disclose who was involved. Equally the industry subgroup placed mounting pressure on the IS subgroup to gain a significant sample of responses from field research. Misalignments between academic and commercial values came to a fore when the director of an independent organization agreed to distribute the IS subgroup's survey through his network. However, despite his initial openness, the director later expressed concern that the involvement of a commercial partner in the Athena project could be seen to compromise his independence. This interaction provoked a detailed and comprehensive reply from the PI and in response, the PI stated that while the project had been co-funded by contributions from a public funding body and an industry partner, he reiterated that "*this does not have any bearing on our independence as a research centre*". However, future conversations with industry experts were carefully coordinated by the PI and co-PI, and in-depth desk research began to be prioritised as the main course of action.

<u>Misalignment Between Expectations and Team Capabilities (Culture – Means)</u>

The interplay between culture and means: The insurance company's involvement in the project had been motivated based on the cultural assumption that the IS subgroup had the means to derive key findings on customers and competitors in the foreign market through field research which would in turn inform the design of the proposed IT artefact. In particular, this assumption developed from conversations that the industry subgroup had with the PI earlier in the project. However, in practice, the IS subgroup faced significant challenges in gathering responses from stakeholders through field research, mainly due to the uncertainties expressed by stakeholders around the involvement of an unnamed industry partner. The PI increasingly recognised that there were misalignments between what the industry subgroup hoped the IS subgroup could achieve and the means they had available. In particular, the PI indicated these misalignments primarily concerned the IS subgroup's lack of prior commercial expertise in the foreign market: "*We knew absolutely nothing about the (market) landscape (but) we knew the technologies. It's tough the way we came at it… I mean this was (like) walking the tightrope, and at times I really felt it. Intellectually I thought we were at the outer edge of what we could actually do. And I think it's a characteristic of these projects*".

The impact of this interplay on cohesion and conflict: Misalignments between culture and means eventually lead to task conflict between the IS subgroup and industry partner. While the industry subgroup had indicated that the IS subgroup's input had been valuable, the findings did not always provide answers to the key questions that the industry subgroup had in relation to various market conditions and parameters. In particular, collating the niche pieces of information requested by the industry subgroup through desk research proved near impossible for the IS subgroup given the commercially sensitive nature of some data, as stated by one analyst: "*it's one thing to sit at a desk and look at things online and (it's another to) talk to people involved in the (foreign market). It's very difficult to get a full understanding of the actual full market landscape*". The industry subgroup eventually decided to engage with a market consultant towards the end of the project to validate the IS subgroup's work and generate cohesion around the findings gathered to date. However, the industry subgroup did not invite the analysts and UX developer to the first meeting with the market consultant which created social conflict. This decision to exclude the analysts and UX developer from the meeting reduced the level of team cohesion and pointed towards a deepening chasm between the subgroups.

The next section provides a discussion of the findings.

7.6. Discussion

The findings points towards how the interplay between macro-level and micro-level factors shaped the conduct of the distributed ISD project, and in turn impacted cohesion and conflict. Existing literature on distributed ISD teams has primarily focused either on the micro-level processes of communication and interactions between team members, or on the macro-level aspects of the environmental context and team characteristics that tend to persist over time (Sarker, Munson, Sarker, & Chakraborty, 2009; Sarker & Sahay, 2003). However, such a dualist perspective can limit understanding of how micro-level interactions shape macro-level structures and vice versa.

The theoretical framework developed by the authors in this paper conceptualised and empirically examined the interplay between macro and micro-level issues and how it shapes group development in terms of cohesion and conflict. This interplay between the macro and micro level helps us to understand how interactions create patterns which eventually become established as macro-level constructs over time, and how these macro-level constructs in turn then shape and constrain human action at the micro-level. In particular, we examine the interplay between the macro-level constructs of structure, identity, and means, and micro-level constructs of vision, approaches, and means.

Table 16 summarises the findings using the theoretical framework described in section 3. The cells of the framework are interrelated rather than independent and therefore cells entries at time overlap.

	Structure	Identity	Culture
Vision	1) Emerging hierarchies and visions in the project team promoted cohesion over task conflict, which eventually lead to social conflict.	4) Conflicting professional interests around project success criteria eventually lead to social conflict as the drive for cohesion impeded task conflict.	7) Clashing assumptions around project goals promoted eventually lead to social conflict as the drive for cohesion impeded task conflict.
Approaches	2) Tensions in the project management relationship promoted cohesion over task conflict, which eventually lead to social conflict.	5) Differing interests in the project management approach promoted cohesion over task conflict, which eventually lead to social conflict.	8) Tension between subgroup values and approaches eventually lead to social conflict as the drive for cohesion impeded task conflict.
Means	3) Structural changes to team capabilities promoted cohesion over task conflict, which eventually lead to social conflict.	6) Nomadic identities within the project team eventually lead to social conflict as the drive for cohesion impeded task conflict.	9) Misalignment between expectations and team capabilities eventually lead to social conflict as the drive for cohesion impeded task conflict.

Table 16. Athena Project Findings

The industry subgroup's continuous drive for cohesion aimed to mitigate differences in structure, identity, and culture across the subgroups; however, in turn this drive for cohesion limited the IS subgroup's ability to engage in task conflict around the vision, approaches, and means of practice. As a result, cohesion was siloed to the commercial ambitions of the insurance company, with comparatively less attention directed towards more mutually beneficial outcomes and the academic ambitions of the IS subgroup. This later led to the emergence of social conflict as members of the IS researcher subgroup felt that they were at the whim of the industry subgroup and were constrained in their ability to challenge the industry subgroup's decisions. The PI's decision to acquiesce to the industry subgroup's demands in order to maintain their relationship consequently meant that the analysts and UX developer were provided with limited opportunities to discuss alternative perspectives around vision, approaches and means of the practice.

The findings presented in this paper aligns with an alcove of literature that suggests excessive levels of task cohesion can have negative implications unless balanced by sufficient amounts of task conflict (Chidambaram, Bostrom, & Wynne, 1990; McAvoy & Butler, 2009). The assumption that cohesion is always positive in distributed ISD teams, as posited by authors such as Garrison, Wakefield, Xu, and Kim (2010), therefore may be misguided as based on our empirical findings we observe that it fails to account for the importance of task-based conflict in addressing issues of diversity within distributed ISD teams. This also suggest that cohesion can be a ‘double edged sword’: while task and social cohesion are essential to build shared understanding and shared commitment between team members, excessive levels of cohesion can impede group development as task conflict is equally essential to negotiate differences. For instance, task conflict is important for mitigating the differences between the diverse positions (i.e. structure), interests (i.e. identity), and meanings (i.e. culture) of distributed team members.

In addition, contrary to existing literature, the findings also point towards instances where excessive levels of cohesion can even contribute to social conflict between subgroups when the level of task conflict is constrained. In particular, social conflict can emerge where one subgroup seeks to maximise cohesion by aligning all team members to their positions, interests, and meanings, and limit the opportunities for others to challenge decisions. Literature rarely differentiates between cohesion that emerges from task-based conflict between individuals involved in the ISD project, and cohesion which is imposed by one subgroup over the other by assuming control of substantive mechanisms such as a project plan. The findings suggest that differentiating between these two forms of cohesion can further explain the potential emergence of social conflict between subgroups.

However, this is not to suggest that task conflict is a panacea for all challenges faced by distributed ISD teams. On the contrary, high levels of task conflict can equally constrain team performance and potentially derail a project, unless balanced by efforts to negotiate differences and restore cohesion. For instance, in the Athena project, cohesion was still pivotal for ensuring that the project was delivered on time, within budget, and to a pre-defined scope. However, a broader definition of project success beyond the ‘iron triangle’ of time, budget, and scope (cf. McLeod, Doolin, & MacDonell, 2012) reveals limitations to this approach. For instance, the Athena project failed to deliver academic output in the form of publications, and the business plan developed by the insurance company became increasingly conservative over time. In addition, the absence of task conflict eventually led to social conflict as a chasm began to open up between the subgroups when members of the IS researcher subgroup felt limited in their ability to air differences of opinion.

The findings therefore point towards the paradoxical need for both cohesion and conflict in distributed ISD teams. Project managers are faced with the challenge of balancing the contradictory demand for both convergent knowledge (cohesion) and divergent knowledge (conflict) around the task. Managing this paradox will at times require a project manager to foster the role of ‘devil’s advocate’ (cf. McAvoy & Butler, 2009) or ‘agitator’ in order to challenge the emergence of excessive cohesion, while at other times it will require the project manager to foster the role of monitor and coordinator in order to ensure that the team progresses with the completion of tasks (cf. Wakefield, Leidner, & Garrison, 2008). This may run contrary to the logic of project managers who view cohesion as the ultimate aim of group decision-making. However, project managers must aim to understand the entangled relationship between cohesion and conflict to ensure they are able to counterbalance each: accentuating the positives of cohesion and conflict while mitigating pitfalls of excessive cohesion and conflict though adaptive management.

The role of devil’s advocate is not necessarily the sole remit of the project manager, and the role can also be delegated to other team members who possess the skills needed to fulfil this role i.e. the ability to challenge the assumptions of other team members through critical thinking and task-based conflict. This can help stimulate more creative ideas, clarify ambiguities and reveal alternative perspectives (McAvoy & Butler, 2009). However, project managers must also put mechanisms in place to ensure that conflict is balanced by efforts aimed at generating cohesion and resolving episodes of conflict effectively. For instance, Wakefield, Leidner, and Garrison (2008) suggest that maintaining internal or intra-group stability in distributed teams requires leaders to adopt the roles of ‘monitor’ and ‘coordinator’; the role of coordinator aims to build and maintain stability by setting rules and standards, while the role of monitor aims to oversee progress, and ensure continuity between the discrete tasks of team members. Wakefield, Leidner, and Garrison (2008) also suggest that depending on the context, leaders equally need to allow team members to express diverse opinions, before seeking consensus and compromise between these divergent views (i.e. facilitator role), as well as actively listening to the needs of team members and supporting their requests (i.e. mentor role).

Therefore, effective leadership requires project managers to adopt different roles depending on the situation at hand and the appropriate response needed. Organizational paradoxes such as cohesion and conflict cannot be solved by ‘splitting and choosing’ one over the other, and instead both phenomena must co-exist (Fairhurst, Smith, Banghart, Lewis, Putnam et al., 2016). At times there may be inherent tensions between the two when team members must walk a tightrope between excessive levels of cohesion and excessive levels of conflict. This tension may only be felt when distributed team members are tasked with driving both alignment (i.e. where team members follow established procedures to achieve common goals) and adaptability (i.e. where team members reconfigure processes to quickly meet changing demands in the task environment) during the software development process (cf. Ramesh, Mohan, & Cao, 2012). When faced with this challenge, project managers must aim to manage both demands simultaneously and foster a virtuous cycle between cohesion and conflict (Fairhurst, Smith, Banghart, Lewis, Putnam et al., 2016). The relationship between cohesion and conflict is best thought of as a dynamic interaction which is characterised by instability. This means that the cyclical relationship between cohesion and conflict is constantly changing based on the interactions between individuals and groups.

The next section brings the paper to a close with a conclusion.

7.7. Conclusion and Implications

In this paper we sought to theorise the interplay of factors which impact cohesion and conflict in distributed ISD projects. We presented empirical findings from the case study of the Athena project to provide insights into the inherent challenges involved in managing the paradoxical phenomena of cohesion and conflict in distributed ISD projects. In terms of theoretical contributions, this paper presents a novel theoretical framework for describing and explaining interactions between ISD project team members within distributed settings. The theoretical development theorises that the interplay between macro (e.g. structures, identities, and cultures) and micro (e.g. vision, approaches, means) level factors impact team cohesion and conflict. For instance, the theoretical insights from the framework help structure the authors' analysis of findings from the Athena project and provide new theoretical perspectives around the emergence of cohesion and conflict in distributed ISD projects.

From a practical perspective, the paper contributes insights into the tensions faced when managing ISD projects in distributed settings which could potentially be of value to project managers, analysts, and developers. Tensions were seen to arise in unexpected ways based on the dynamic interplay between macro- and micro-level factors. For instance, the findings point towards the tensions that can emerge between subgroups with contrasting styles of project management (*Structure – Approaches*), and when individuals have conflicting criteria for project success (*Identity – Vision*). Furthermore, nomadicity can pose challenges in distributed settings where certain team members adopt project roles that span multiple organizations (*Identity – Means*), as well as misalignment between the capabilities of a team and the expected project outcomes (*Culture – Means*). An awareness of these practical challenges is essential to ensure that team members are equipped to address features of complexity in distributed settings.

The theoretical framework could also help practitioners anticipate challenges around cohesion and conflict during the conduct of a distributed ISD project. For instance, the PI of the Athena project later indicated that the theoretical framework could have potentially helped him to detect areas of misalignment between the subgroups if it had been at hand early on in the Athena project. Applying the theoretical framework to a case could assist practitioners in taking action to mitigate emerging tensions between subgroups and improve team performance; this proposition could be explored in future empirical studies.

One limitation of the case study approach is that the findings may not be generalizable to other contexts. Future research will apply the theoretical framework to other cases in order to further validate the underlying concepts and refine the relationships between these concepts. In addition, future research will seek to develop a set of recommendations from a cross-case analysis around how ISD project managers can foster a mind-set of ‘openness’ within distributed ISD teams. Openness as a mind-set aims to foster a ‘hybrid’ style of project management, which continuously balances the seeming paradoxical phenomenon of team cohesion and conflict. The concept of ‘authenticity’ (cf. Michie & Gooty, 2005) will also be looked at to understand the challenges of value alignment among diverse individuals and groups within distributed settings.

Postface to Chapter

This chapter points to the ‘double-edged sword’ of cohesion and suggests that periods of conflict are also needed to mitigate differences between team members from diverse contextual backgrounds. The next chapter builds on this insight to further examine cohesion and conflict in team interactions based on findings from a third in-depth case study: the CDSS project. In addition, the conclusion to chapter 8 points towards the need to consider how team members can best leverage cohesion and conflict in distributed ISD projects. This will be further investigated in Chapter 9 – specifically through a cross-case analysis of the three in-depth case studies. Meanwhile, the next chapter, focuses on the need for a new leadership mind-set, which embraces the tension between both cohesion and conflict during team interactions.

Chapter 8: Distributed ISD Team Leadership and the Paradox of Cohesion and Conflict[5]

Preface to Chapter

This chapter seeks to investigate the following research question: *What is the role of distributed ISD project team leadership in leveraging cohesion and conflict?* In particular, the chapter examines how team leadership relates to the macro-level and micro-level factors which shape team interactions. This was motivated by an emerging insight that some team members in the CHP and Athena project case studies were more influential than others in shaping team interactions, and assumed a position of team leadership. Based on this insight, this chapter investigates how team leadership can leverage cohesion and conflict in order to derive a more complete perspective of distributed ISD project team performance.

The research question investigated in this chapter is examined by applying the third iteration of the theoretical framework to analyse the in-depth case study of the CDSS project. Chapter 8 directs attention towards how team leaders employ different styles of leadership in order to effectively navigate the tension between cohesion and conflict. The team leadership styles outlined in Quinn's (1988) Competing Values Framework are used to guide an analysis of the team leader's responses to cohesion and conflict. The discussion also posits how Quinn's (1988) leadership styles might relate to the macro-level and micro-level factors in the theoretical framework and introduces the concept of 'leadership intelligence' as a mindset which embraces both cohesion and conflict. In addition, the concept of 'agitation' is put forward as a means to address the perceived limitations in Quinn's (1988) model of leadership.

[5] This chapter is based on a paper published in the proceedings of the 2019 Hawaii International Conference on Systems Science (HICSS-52), Big Island, Hawaii, January 2019.

Abstract

Distributed ISD projects are often typified by deep-seated differences between team members from diverse organizational and professional backgrounds. Consequently, literature suggests that cohesion is crucial for aligning the efforts of a distributed ISD team; however, a competing body of literature also asserts that conflict is essential for capitalizing on diverse knowledge flows. Team leaders can therefore face a conundrum around how to balance the paradoxical need for both cohesion and conflict. In this paper, we develop a theoretical framework to analyze case study findings from the 'CDSS project', a distributed ISD project undertaken in an Intensive Care Unit (ICU). We find evidence that distributed ISD leaders must adopt a 'paradox mindset', one which embraces both cohesion and conflict. Based on these findings, we also put forward the concept of 'leadership intelligence' which describes the simultaneous enactment of a diverse set of leadership styles for balancing constructive cohesion and conflict.

8.1. Introduction

Information System Development (ISD) is a crucial mechanism for modern organizations to respond to changes in the internal and external environment. However, the management of ISD is an inherently complex task. According to The Standish Group (2015), 52% of ISD projects in 2015 encountered significant challenges, while 19% were deemed to have failed. A significant body of literature has been dedicated to outlining the criteria for ISD project success; yet despite this, the rates of ISD project failure continue to remain high. IS scholars increasingly point towards the need to manage social aspects of ISD as it is a key determinant of ISD performance (Kotlarsky & Oshri, 2005). For instance, ISD team performance can be hampered due to a lack of cohesion owing to interpersonal differences between groups (Carte & Chidambaram, 2004).

Distributed ISD projects are a unique category of ISD practice in which team members are organizationally, geographically, or temporally dispersed

(Windeler, Maruping, Robert, & Riemenschneider, 2015). The creation of clear and agreed IT solutions is often inhibited in distributed ISD settings due to tensions between macro-level patterns and micro-level interactions among team members (McCarthy, O'Raghallaigh, Fitzgerald, & Adam, 2018a; Sarker & Sahay, 2003). For instance, macro-level differences between the positions, interests, and values of a distributed team in turn constrain and enable the interactions between team members during the development of an IT artefact.

While team cohesion is essential for the performance of distributed teams (Garrison, Wakefield, Xu, & Kim, 2010; Powell, Piccoli, & Ives, 2004), there is also a competing body of literature which states that effective decision making in distributed settings requires conflict in order to capitalize on the diverse knowledge flows of multi-disciplinary specialists (McAvoy & Butler, 2009; X. Yang, Tong, & Teo, 2015). In particular, ISD team leaders are presented with the problem of balancing the opportunities afforded by a divergence of ideas through conflict, while still aligning team members' efforts through sufficient levels of cohesion. This presents ISD team leaders with the significant challenge of understanding how to simultaneously address the paradoxical phenomena of cohesion and conflict. According to Quinn (1988), leaders must enact different styles of leadership to address paradoxical tensions, utilizing their intuition and experience to move beyond planning alone. Our ability to understand the role of leadership in balancing this paradox will be crucial for ensuring team effectiveness going forward.

According to Fairhurst, Smith, Banghart, Lewis, Putnam et al. (2016), such paradoxes require new theoretical lenses which allow researchers and practitioners to both 'zoom in and zoom out' from the micro-level interactions and the contextual macro-level patterns to better understand the emergence of paradoxes. However, ISD literature to date has yet to explore how the interplay of macro-level patterns and micro-level interactions impact cohesion and conflict in distributed teams. In addition, the role of leadership in balancing these paradoxical phenomena has yet to be explored. The research objective of this paper is to investigate the interplay between macro- and micro-level factors, cohesion and conflict, and the leadership of distributed ISD teams. Based on this objective, we investigate the following research question: *What is the role of different leadership styles in dealing with cohesion and conflict in distributed ISD teams?* Empirical findings are gathered from the in-depth case study of a Clinical Decision Support System (CDSS) project in order to explore and provide insights. The case study was conducted over a five-month timeframe, during which time the distributed ISD project team faced acute challenges when designing a decision support system for the mission critical environment of an ICU. We develop a theoretical framework to describe and explain interactions among the distributed team and investigate the factors that affect cohesion and conflict.

The remainder of the paper is structured as follows: Section 2 reviews relevant literature published between 2000 and 2018 in the AIS senior scholar basket of eight journals and prominent IS conferences. Section 3 introduces the research design while Section 4 develops the theoretical framework. Section 5 presents findings from the case and Section 6 discusses these findings as relevant to academic and practitioner communities. Section 7 offers a conclusion.

8.2. Literature Review

ISD projects are an innately social undertaking as individuals must continuously interact to share ideas, resolve differences, and coordinate resources (Hsu, Chu, Lin, & Lo, 2014; Sawyer, Guinan, & Cooprider, 2010). For instance, ISD projects typically involve participants from diverse backgrounds who engage in an emergent process of communication, sense-making and negotiation around the proposed system (Levina, 2005; Luna-Reyes, Zhang, Gil-García, & Cresswell, 2005). Some scholars argue that IS primarily concerns the social construction of knowledge, where individuals and groups seek to collaboratively build new understandings while developing a system (J. Lee, Park, & Lee, 2015; Luna-Reyes, Zhang, Gil-García, & Cresswell, 2005; Sawyer, Guinan, & Cooprider, 2010). Accordingly, individuals must engage in social interactions to share and integrate the knowledge required for systems development within a set timeframe (J. Lee, Park, & Lee, 2015; Sawyer, Guinan, & Cooprider, 2010).

ISD projects are increasingly conducted by distributed teams consisting of individuals from different organizational, geographic, and disciplinary backgrounds (Kotlarsky & Oshri, 2005; Powell, Piccoli, & Ives, 2004; Sarker & Sahay, 2003). Distributed ISD project teams must collaborate remotely across different geographical locations in order to perform tasks. This is facilitated by the advent of increasingly sophisticated IT solutions such as email, instant messaging, and video conferencing (Kotlarsky & Oshri, 2005; McCarthy, O'Raghallaigh, Fitzgerald, & Adam, 2018a). However, despite these advances, distributed project teams still face inherent challenges around collaboration (Garrison, Wakefield, Xu, & Kim, 2010; McCarthy, O'Raghallaigh, Fitzgerald, & Adam, 2018a; Sarker & Sahay, 2003). Previous IS studies therefore suggest that team cohesion is a key determinant of team performance in distributed ISD projects (Garrison, Wakefield, Xu, & Kim, 2010; McAvoy & Butler, 2009; X. Yang, Tong, & Teo, 2015).

Team cohesion can be defined as the extent to which team members are aligned in their shared understanding of and shared commitment to project tasks e.g. the actions that individuals and groups need to perform based on agreed plans (X. Yang, Tong, & Teo, 2015). Shared understanding and shared commitment are essential for cohesion in diverse teams (X. Yang, Tong, & Teo, 2015). They also help ensure the durability of solutions designed for tackling identified problems (Conklin, 2005). Shared understanding refers to "the degree to which people concur on the value of properties, the interpretation of concepts, and the mental models of cause and effect with respect to an object of understanding" (Bittner & Leimeister, 2014, pg. 115). Shared commitment then refers to the degree to which team members are willing to dedicate resources towards the delivery of proposals that have gained shared understanding (Briggs, Kolfschoten, & Vreede, 2005; Conklin, 2005; X. Yang, Tong, & Teo, 2015).

However, generating cohesion in distributed ISD teams is an inherently challenging task for leaders due to interpersonal differences between individuals and groups (X. Yang, Tong, & Teo, 2015). Literature points towards challenges that can arise between ‘subgroups’ in distributed ISD teams characterized by diverse disciplinary backgrounds, skill sets, experience etc. (Aggarwal, 2014; Carton & Cummings, 2012). Subgroups can form where team members perceive hypothetical divisions, also referred to as ‘faultlines’, between other members of the project team (Pflügler, Wiesche, & Krcmar, 2018; Van Knippenberg & Schippers, 2007a). As stated by Carton and Cummings (2012), the co-existence of subgroups creates a notable change to the team dynamic as subgroup members must continuously remain cognizant of fellow subgroup members as well as other subgroups. Subgroups can develop fragmented interests and meanings around the problem-solution coupling which creates challenges in identifying a way forward.

While cohesion is recognized by IS scholars as an important determinant of team performance, there is also a body of literature which points towards the negative impact of excessive cohesion among project teams (cf. Chidambaram, Bostrom, & Wynne, 1990; McAvoy & Butler, 2009). For instance, McAvoy and Butler (2009) suggests that excessive levels of cohesion can impede the performance of ISD project teams where the drive for consensus inadvertently suppresses disagreement and the appraisal of alternatives. This can have a negative impact on project outcomes, as the suppression of divergent ideas can limit the development of innovative and effective IT artefacts (Aggarwal, 2014; McAvoy & Butler, 2009). Team conflict can be defined as the extent to which team members diverge in their shared understanding of and shared commitment to project tasks (McAvoy & Butler, 2009). Studies have shown that team conflict can improve team performance as it promotes the critical analysis of project tasks (Carte & Chidambaram, 2004).

Literature differentiates between conflict which is ‘constructive’ and ‘destructive’ to team performance. Constructive conflict occurs when team members deal with differences in interpretation around tasks through argumentation and clarification (Carte & Chidambaram, 2004; Van den Bossche, Gijselaers, Segers, Woltjer, & Kirschner, 2011). Meanwhile, destructive conflict centers on social differences between team members in terms of their positions, interests, values. Similarly, cohesion can be categorized as constructive and destructive in nature. Constructive cohesion helps align the efforts of team members through shared understanding and shared commitment, while destructive cohesion can emerge where the appraisal of alternatives is suppressed due to groupthink among members of the team (McAvoy & Butler, 2009).

A key challenge for ISD team leaders therefore centers on how best to balance the opportunities afforded by constructive conflict, while still maintaining sufficient levels of cohesion. Quinn (1988) suggests that in order to address organizational paradoxes, team leaders must enact different leadership styles that foster both stability and flexibility (see Table 17). Wakefield et al. (2010) found that three of these styles outlined by Quinn (1988) mitigate conflict, whereas there was no conclusive evidence that the fourth style (mentor) had a direct impact on conflict. However, we find that both Quinn (1988) and Wakefield et al. (2010) fail to consider constructive conflict for organizational and team performance. Therefore, it remains unexplored whether these styles are sufficient to balance both cohesion and conflict.

	Description
Coordinator	Maintains stability by setting rules and standards, and outlining constraints. A coordinator style aims to *control* the team's assigned work.
Monitor	Creates stability by measuring progress, and distributing this data. A monitor style aims to *oversee* the work that the team must accomplish.
Facilitator	Fosters flexibility by seeking consensus around divergent opinions. A facilitator aims to actively listen to, and *negotiate* team differences.
Mentor	Promotes flexibility by supporting the personal development of individuals. A mentor style aim to create *awareness* of team members' needs.

Table 17: Styles of Team Leadership (after Quinn (1988))

8.3. Research Design

An in-depth case study approach (cf. Yin, 1994) was chosen to study the information-rich case of a distributed ISD project. This was selected as the most appropriate research design as it enables the researcher to elicit detailed accounts of individuals' actions, experiences, and perspectives in their natural setting. The project in question, the CDSS project, had two main objectives: the development of software to support decision making in the ICU ward, and the conduction of a research study to evaluate this solution for improving patient outcomes.

The ISD project team consisted of a team leader and two subgroups: the 'clinical subgroup' consisting of a ICU dietician, clinical lead, and pharmacist; the R&D subgroup consisting of the developer, postdoctoral researcher, research officer, and research nutritionist. The ISD project team was distributed across three locations: a public hospital, the main campus of a university, and a research center located off-site in a satellite campus. The project team utilized IT solutions such as email, conference calls, and an online knowledge repository. Subject to the availability of team members and their ability to travel to the research center, face-to-face meetings were also organized.

The case study focuses on a five-month timeframe between November 2016 and March 2017. The lead author was located in the research center (two to three days a week, eight hours a day). In addition, the lead author attended team meetings (each typically lasting 2 hours), and regular meetings with individual team members around work progress and challenges. To increase the robustness of findings, case study data was triangulated from three different sources (Miles & Huberman, 1994). (i) The lead author recorded 51 pages of participant observations in field notes; (ii) this data was complemented by eight semi-structured interviews conducted with members of the team between June and October 2017; each face-to-face interview lasted between 45 and 60 minutes and was recorded and transcribed; (iii) project documents were collected and analyzed to unearth further insights.

This included over 70 team emails, 14 slide decks, and 11 documented meeting minutes.

The authors then developed an evolving theoretical framework (McCarthy, O'Raghallaigh, Fitzgerald, & Adam, 2017, 2018a) which set out the initial research themes. The framework was iteratively reviewed and refined through reflection on and analysis of the collected data (cf. Carroll & Swatman, 2000). The lead author analyzed the case study data from November 2017 onward using two primary techniques: coding and vignettes. Open, axial, and selective coding (as per Strauss and Corbin (1990)) were used to analyze the transcribed interview data. The lead author's perception of variables and relationships, otherwise referred to as theoretical sensitivity, was influenced by the theoretical development. Initially, the lead author coded 27 nodes in NVivo, and then aggregated these into 9 overarching nodes. Finally, selective coding was completed using the theoretical framework. Vignettes as per Miles and Huberman (1994) were also used to produce, reflect on, and learn from participant observation data and key moments in the 'everyday life' of the project. In addition, the lead author met weekly with co-authors to recount his observations and make sense of findings. During these meetings, which typically lasted one to two hours, the other authors would question the lead author about the data in order to extract relevant themes.

8.4. Theoretical Development

In investigating the research question, the authors developed a theoretical framework to assist in describing and explaining how the interplay between the macro-level patterns and micro-level interactions impacts cohesion and conflict in distributed ISD project teams. The macro-level relates to those large-scale social patterns and trends which shape individual behaviors over time, whereas the micro-level concerns the study of interactions between individuals and objects in the field (Sarker & Sahay, 2003). The term interplay refers to the reciprocal relationship between the two dimensions which exist at different levels of analysis i.e. macro and micro. For instance, micro-level interactions may produce patterns which eventually become established as macro-level constructs. These macro-level constructs then both constrain and enable team interactions.

Theory building was undertaken following the structured-case approach (cf. Carroll & Swatman, 2000, pg. 236) which consists of "constructing and articulating a preliminary conceptual structure, collecting and analyzing data, and reflecting on the outcomes to build knowledge and theory". The resulting framework is grounded in both *a priori* concepts from existing literature and *a posteriori* insight from the case study. The authors first drew on a priori macro- and micro-level concepts from the seminal works of Parsons (1951) and Bourdieu (1977). A posteriori empirical data was then used to examine the interplay between these macro- and micro-level concepts, and how the interplay impacts cohesion and conflict.

Building on Parsons (1951), our framework looks at three macro-level factors: *Structure*, *Identity*, and *Culture*. *Structure* deals with the different positions, roles, and rules which shape how team members take action across situations. *Identity* deals with the different interests of team members which motivate their courses of action. Finally, *Culture* refers to the different shared meanings, values, and assumptions which are internalized by team members.

Building on Bourdieu (1977), we turn attention to three micro-level factors: *Vision*, *Approach*, and *Means*. The construct of *Vision* deals with the intended course of action which will be pursued by individuals in the field of practice, and which in turn shapes their decisions and utilization of resources in the field. *Approach* refer to the 'modus operandi' of how individuals achieve a vision which is guided by the tacit knowledge acquired through their accumulated experience in practice. *Means* refers to the resources or forms of capital which are utilized by individuals to pursue visions in the field.

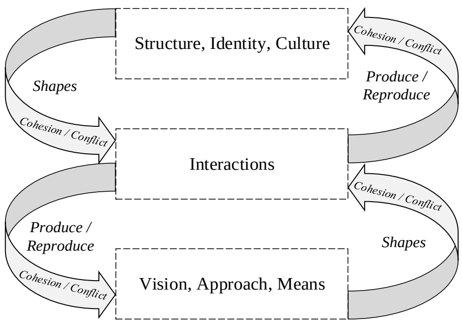

Figure 10. Conceptual Diagram (Version 3)

Figure 10 combines the theoretical pillars to illustrate how this interplay impacts cohesion and conflict *between* subgroups and the team leader. The upper half of the diagram illustrates how structure, identity and culture shape interactions, and how these interactions in turn produce and reproduce the macro-level. The lower half of the diagram shows how interactions produce and reproduce the vision, approach, and means, which further shape interactions. While authors such as Pettigrew (1987) have previously looked at context and process interactions within an organizational setting, our theoretical framework is differentiated by its specific focus on how the interplay between macro- (i.e. structure, identity culture) and micro-level (i.e. vision, approach, means) factors shape the paradoxical tension between conflict and cohesion in distributed ISD teams.

8.5. Findings

This section discusses how the interplay between the macro- and micro-level impacted cohesion and conflict between the team. The subsections describe three examples based on cells of the framework which best demonstrate the paradox of cohesion and conflict.

8.5.1. Interplay between Structure and Practice

During recruitment, the team leader had briefed each individual on what the project would entail; however, the exact structure of the distributed ISD team was not defined upfront. Team members recognized that the team leader was at the apex of one hierarchy for decisions relating to the project and the research study, while the clinical lead was at the apex for decisions relating to the software and its implementation in the ICU ward. Meanwhile, the position of other team members resembled a flat hierarchy.

However, in performing their work, individuals began to position themselves against an evolving team hierarchy. In this de-facto hierarchy, the ICU dietician assumed a more prominent position and asserted her own vision for the research study and software solution. At the same time, the developer was relegated to a low position in the hierarchy as other team members saw his role as being of secondary importance to the project. As a result, the developer's vision for the software was oftentimes less influential in the team interactions. Reinforcing this de-facto hierarchy, some team members began to utilize private email interactions and side meetings to expedite decision-making. For instance, some decisions around the research study took place during private meetings between the team leader, ICU dietician, and the research nutritionist. This was constructive initially as it enabled some team members to clarify ambiguities around the emerging vision. This emerging vision in turn shaped the subgroup interactions as the discussions began to center on the impediments to these visions.

Individuals who were not included in these meetings did not have visibility of ongoing discussions, despite the pertinence of their input, which the pharmacist felt was problematic: "*you can feel a bit excluded from parts of the project if you hear 'oh they're meeting today, ok I'm not involved in that'. I think it's not good for the communication in the project*". This impeded cohesion and led to fragmented discussions around the vision as some team members did not have oversight on decisions. In addition, the roles of team members sometimes seemed to overlap which made it difficult to resolve conflict around the vision, such as in the case of the ICU dietician and research nutritionist. As stated by the postdoctoral researcher, the ICU dietician and research nutritionist both assumed they had the final say on the revised ICU guidelines which created: "*some confusion in the project between the ICU dietician and research nutritionist*". As a result, the de-facto hierarchy eventually collapsed due to uncertainty around who had the final say on decisions, and this in turn led to increasing levels of conflict around the vision of the project. The developer began to disagree with the team leader's decisions and tried to assert his position by assuming responsibility for deadline setting and repeatedly called on team members to provide feedback on the software's requirements. However, no action was taken by others in the team as he was seen as only having an operational role in the project.

8.5.2. Interplay between Identity and Practice

Delineations between the professional identities of team members in turn shaped interactions during meetings. These delineations were created by the team leader to assert the domain expertise of team members during discussions around the project. For instance, the team leader drew delineations between team members who were identified as "*scientists"* and "*non-scientists*" based on whether or not they had the means to conduct research. The team leader observed that: "*clinicians aren't scientists and they needed to learn how to conduct science from scientists. On the other side, scientists aren't clinicians".* The clinical subgroup was also quick to delineate between the expertise of team members who were identified as "*clinical*" and "*non-clinical*", based on whether they had working knowledge of the daily practices in the ICU ward. These delineations were constructive and helped team members figure out who to direct specific questions to.

However, based on these delineations, the developer found himself with the challenging professional identity of a 'middle man' between two disciplines, as he was neither a 'clinician' nor a 'scientist'. As the sole IT expert on the team, the developer felt he didn't have the means to deliver on all that was being asked of him and referred to his predicament as "*a team of one*". Cohesion suffered as other team members saw the developer's professional identity as separate from the rest of the team. The developer tried to challenge this identity during interactions by requesting feedback however, other team members did not recognize his means to enact change. Over time the developer became increasingly isolated, eventually distancing himself from the project. The team leader also conceded that she often had limited knowledge of the work that the developer had completed which meant that "*there has to be massive trust; that's really problematic for me*".

Differences in team members' professional interest also emerged within subgroups, such as in the case of the clinical lead and ICU dietician. At the second project meeting, the clinical lead had outlined his professional interest in ensuring that the project should not generate disruptive change in the ICU ward. Based on this, he proposed that the software solution would only display digitalized patient information and consequently, any additional feature including the predictive modelling of patient outcomes would be ruled out of scope. Because of his senior position in the hospital, the clinical lead was able to enforce this decision and generate team cohesion around the scope. However, following this meeting, the clinical lead's engagement in the project temporarily ceased for the subsequent four months of the project, and the ICU dietician's professional interests became more influential in discussions around the software. For instance, the ICU dietician began to insist that the software solution should include a predictive modelling feature to support decision making which contradicted the clinical lead's original decision. The ICU dietician noted her vested professional interest in this feature: "*I think that it will strengthen the role of nutrition in the unit… Information is power and I think that it will be very useful*". This conflict around the scope helped open up discussions around how the software would differentiate itself from existing technology platforms in the ICU ward. Nevertheless, members of the R&D subgroup were concerned that the clinical lead would later veto the ICU dietician's decisions once he became aware of it. Eventually the team leader facilitated a meeting between the clinical lead and ICU dietician, where the clinical lead decided to concede that the predictive modelling should be ruled in scope. However, uncertainty remained among the R&D subgroup around whether this question was fully resolved. For example, the developer suspected that the clinical lead was not fully convinced of the benefits associated with the modelling feature. The developer questioned whether the clinical lead might yet reverse this decision later on, forcing considerable rework.

8.5.3. Interplay between Culture and Practice

The value placed on flexibility and exploratory discussions by the team leader shaped interactions between team members. For instance, the team leader deferred the creation of a project plan, and often dropped items from the meeting agenda to allow more time for dialogue. This approach was beneficial at the start of the project as it facilitated learning and constructive conflict around what the software should achieve. The leader afforded team members the opportunity to question disciplinary experts in the team and learn about what their work involved. In addition, the leader dropped less important items from the agenda and allowed team members to focus on discussion around the value proposition of the software for users in the ICU ward.

However, subgroup members felt that this approach created uncertainties around the interdependencies between team members' tasks and the critical path of the project. As stated by the pharmacist: "*(we needed) a project plan to work towards… and someone following up to say 'this is your role, have you done it?'*". The R&D subgroup requested clarifications from the team leader on how work should proceed. However, this created bottlenecks in the decision-making process. As a result, the developer, for one, aired his concern that development work would take longer than expected, due to the challenges faced in sharing an understanding of requirements. The developer noted: "*The project is essentially managing itself which is a problem… I'm the only one putting up the deadlines*".

Each subgroup came with different cultural assumptions around the level of complexity involved in the project which also shaped interactions with the team leader. The ICU dietician assumed that her prior PhD research had specified the software's data requirements. However, the developer did not share this viewpoint and instead he felt that the detail around requirements had yet to be determined. As stated by the developer: "*The problem is that clinicians think that the requirements are already packaged... They assume that we already have requirements – the short answer is no*". In order to challenge cultural assumptions, the developer adapted his approach by sending repeated emails directly to the team leader and clinical subgroup which pointed to areas where clarification was needed. Eventually this led to high levels of conflict as team members became frustrated with the developer's preoccupation with uncertainties. As stated by the team leader: "*I don't know if this is an individual thing or a discipline issue but (the developer's) tendency is always to see the pitfalls before anything else is even acknowledged*". The developer challenged the clinical subgroup by pointing out shortcomings in their thinking but most team members seemed unaware that the developer was doing this in order to elicit software requirements.

8.6. Discussion

Existing literature on distributed ISD teams has primarily focused either on the micro-level interactions between team members, or on the contextual macro-level patterns that tend to persist over time (Sarker & Sahay, 2003). However, such a dualist perspective can limit understanding of how micro-level interactions shape macro-level patterns and vice versa. The theoretical framework developed by the authors was used to examine how the interplay between the macro and micro-level impacts cohesion and conflict in the CDSS project. Table 18 provides a summary of the findings discussed in section 5. The findings point towards how the interplay between macro-level patterns and micro-level interactions shaped the conduct of the distributed ISD project, and in turn impacted cohesion and conflict. It should be noted that findings from a single case are unlikely to be generalizable to all settings (Yin, 1994). Nevertheless, in this section, we seek to put forward a set of propositions based on our case study findings which can be examined in future studies.

	Structure	*Identity*	*Culture*
Vision	The team leader's flat hierarchy helped clarify ambiguities around the vision through conflict. However, this excessively inhibited cohesion due to uncertainty around roles.	The team leader embraced conflicting interests within the clinical subgroup to clarify the project vision. It took time to resolve this conflict however, which inhibited cohesion.	The team leader's openness to conflicting assumptions around the vision helped clarify the value proposition. However, different assumption eventually inhibited cohesion.
Approach	The team leader endorsed communication backchannels to improve cohesion around the approach. However, conflict emerged as some members felt excluded from these dialogs.	The team leader identified the developer as the sole IT expert in the team which allowed him to control the ISD approach. However, this siloed approach eventually inhibited cohesion.	The value placed on flexibility by the team leader enabled learning and conflict. However, other team members valued a regimented approach which eventually inhibited cohesion.
Means	The leader recognized that the clinical subgroup's involvement was crucial to cohesion around the software requirements. However, constrained input from the clinical subgroup led to conflict between team members.	The team leader's delineations between professional identities generated cohesion by clarifying domain expertise. However, some team members could not challenge their identity which led to conflict.	The leader's ability to foster conflict around individuals' diverse meanings helped generate creative solutions. However, this also inhibited cohesion due to gaps in each team members' knowledge.

Table 18. **CDSS Project Findings**

Findings point to the paradoxical need for both cohesion and conflict in distributed ISD. For instance, the CDSS project highlights the inherent difficulties that can arise when distributed team leaders do not embrace the paradox of cohesion and conflict, and instead promote one element over the other. For instance, the style of leadership adopted by the team leader in the CDSS project primarily fostered conflict over cohesion which in turn impeded team performance. While the team leader's style initially helped promote exploratory dialogue, learning and creativity, the lack of coordination resulted in increasing levels of conflict and impeded cohesion.

High levels of conflict arose between the developer and other team members around the vision of the project, and the overall approach.

However, a leadership style aimed at only promoting cohesion over conflict may also be ineffective. For instance, findings from our previous case study (McCarthy, O'Raghallaigh, Fitzgerald, & Adam, 2018) suggest that a leadership style which prioritizes cohesion in all team interactions, and intentionally constrains the level of conflict, can impede the team's ability to challenge assumptions. Taken together, this suggests that distributed ISD team performance rests on balancing both cohesion and conflict.

Miron-Spektor, Ingram, Keller, Smith, and Lewis (2018) have pointed to the need for organizations to adopt a 'paradox mindset' which is both accepting of and energized by paradoxical tensions. However, the notion of a paradox mindset has not previously been applied to cohesion and conflict in distributed ISD teams. Building on our theoretical framework, we suggest that a paradox mindset in distributed ISD must cultivate a cognitive awareness of how the interplay between macro- and micro-level factors shapes cohesion and conflict. For instance, a paradox mindset might seek a balance between top-down structures and an emerging hierarchy, a collective identity and individualized interests, and a single integrated culture and diverse cultures. We therefore put forward our first proposition which can be examined by future researchers and practitioners:

> **Proposition 1:** *The absence of a 'paradox mindset' (cf. Miron-Spektor, Ingram, Keller, Smith, & Lewis, 2018) can lead to destructive cohesion and / or conflict in complex distributed ISD projects.*

Our next proposition centers on team leadership styles in distributed ISD. Wakefield et al. (2008) suggest that Quinn's (1988) four team leadership styles are best suited to resolving different forms of conflict in distributed teams. However, Wakefield et al.'s (2008) application of Quinn's (1988) Competing Values Frameworks fails to consider the paradoxical tension between both cohesion and conflict in distributed ISD project teams. The authors discuss how the four leadership styles can be used to mitigate conflict, but do not reflect on the potential benefits of conflict, such as creative problem solving and the avoidance of groupthink (McAvoy & Butler, 2009). A paradox mindset must also recognize the importance of promoting conflict for team performance. For instance, our case study findings suggest that conflict can help challenge team members' assumptions and promote creativity during meetings.

Based on this insight, we aim to go beyond the four styles originally outlined by Quinn (1988) and Wakefield et al. (2008) to purpose a new style which we call 'agitator'. This can simultaneously be enacted alongside the previously mentioned four team leadership styles, and seeks to embed conflict into interactions in order to challenge cultural assumptions, foster divergent interests, and overcome structural silos. In particular, this additional style can encourage team members to adopt the role of devil's advocate (cf. McAvoy & Butler, 2009) to ask challenging questions through focused periods of conflict. In the CDSS project, the developer often played the role of devil's advocate by questioning the ICU dietician and pharmacist, and challenging the logic behind their decisions. However, the developer at times was not supported in this role by the team leader as it was seen as an impediment to progress. The devil's advocate role can be constructive for challenging decisions before they are considered valid. Having said that, if left unchecked it can also become destructive. Team leaders must therefore learn when it is appropriate to enact the devil's advocate role and when it is not. Based on this, we put forward a second proposition:

> **Proposition 2:** *An 'agitator' style can promote constructive conflict in distributed ISD projects, but can lead to destructive conflict if left uncontrolled.*

Finally, we propose that team leaders must cultivate 'leadership intelligence' in order to effectively respond to the paradox of cohesion and conflict in distributed ISD. We define leadership intelligence as the ability to simultaneously enact a diverse set of leadership styles (i.e. coordinator, monitor, facilitator, mentor, and agitator); in particular, leaders must alternate between 'closed' leadership behaviours (i.e. coordinator, monitor) which place constraints on individuals' actions, and 'open' leadership behaviours (i.e. mentor, agitator) which empower individuals by limiting centralised control.

In proposing ‘leadership intelligence’, we extend the works of Quinn (1988) and Wakefield, Leidner, and Garrison (2008) by asserting that leaders must become mindful of when to promote and suppress different leadership styles in order to balance the paradoxical tension between cohesion and conflict during distributed ISD team interactions. For instance, over the course of a meeting, the leader may enact different leadership styles in order to frame macro- and micro-level factors in different ways depending on what the situation demands and dynamics between individuals in the room. This requires the sensitivity to know when the saturation point of each style is reached based on the leader’s experience.

Leadership intelligence also fosters an awareness of how the interplay between macro-level patterns and micro-level interactions shape an ISD project. Closed leadership behaviors can aim to enforce deterministic macro-level patterns such as structure, identity, and culture to create constraints around team members’ actions. For instance, leaders can enforce a clear top-down structure, and collective project-level identity and culture. Meanwhile, open leadership behaviors can seek to provide team members with the freedom to make decisions around the vision, approach, and means of practice. Leaders must alternate between these paradoxical leadership behaviors as circumstances demands. While leadership intelligence is also important for co-located teams, it becomes imperative in distributed ISD teams due to the unique challenges faced in these settings. Leadership intelligence is essential in distributed ISD projects as team leaders must provide stability to ensure that the distributed team are aligned in their efforts, while still offering flexibility so the distributed team can best exploit their diverse capabilities and develop creative solutions. For instance, the structure of a distributed team may not be clearly defined (Sarker & Sahay, 2003) which in turn can create uncertainty around the approach. In addition, the inherent diversity of distributed ISD teams can lead to differences in interests and culture meanings (Garrison, Wakefield, Xu, & Kim, 2010), which in turn leads to divergent perspectives. This leads us to one final proposition:

Proposition 3: *Leadership intelligence is essential for simultaneously balancing the paradox of cohesion and conflict in complex distributed ISD projects.*

Findings suggest that team leaders should recognise the switch from constructive to destructive cohesion and conflict. Team leaders should effectively engage team members in necessary conversations around the vision, approach, and means of the project, while ensuring that unfocused conversations around team structures, identities, and cultures do not continue indefinitely. Otherwise this can lead to periods of destructive conflict. While discussions could eventually be transformed into periods of constructive conflict, the team leader must support team members in enacting the role of devil's advocate else team members' positions, interests, and assumptions remain unchallenged, leading to continuing divisions.

Team leaders should avoid inadvertently enacting leadership styles without recognising how they shape both cohesion and conflict. The inadvertent use of leadership styles means that sometimes the wrong style may be enacted at the wrong time. For instance, the team leader in the CDSS project at one point enacted a mentorship style to promote conflict around the team structure, despite calls from team members to enact a coordinator style and clarify the decision making hierarchy.

Leadership intelligence requires that team leaders enact different leadership styles simultaneously. For instance, a team leader could enact an agitator style to promote constructive conflict around the vision, while simultaneously enacting a coordinator style to promote constructive cohesion around the approach. Table 19 describes observations from the CDSS project on the aspects of leadership intelligence and provides recommendations around how team leaders can effectively balance cohesion and conflict through framing macro- and micro-level factors.

	Observations from CDSS Project	Recommendation
Coordinator	The level of coordination was limited but impeded constructive conflict as team members were unclear about their roles and responsibilities. Consequently, backchannels of communication emerged in order to air differences around the vision.	While the team leader did allow team members to air their differences of opinion, ultimately team members needed more support in moving towards a shared understanding and commitment to a vision and an approach.
Monitor	Our findings show little evidence of a monitoring style as exemplified by the lack of a formal project plan. Destructive conflict began to stifle the progress of the project due to uncertainties around the approach.	While the team leader did place some value on a flexible approach which provided team members with an opportunity to engage in constructive conflict, formalized planning could have addressed a shift towards destructive conflict partially.
Facilitator	The facilitator style was adopted by the team leader to help bridge the divergent interests of the ICU dietician and clinical lead around the software solution's vision; however, the absence of this style later on created uncertainties around the vision.	While the team leader did embrace some of the divergent professional identities across the team, this should have done consistently and to move the different groups towards a shared understanding and commitment.
Mentor	The team leader's style most resembled that of mentorship in that it helped support team learning by providing individuals with the flexibility needed to explore the approach through discussion.	While the team leader did foster a flexible culture which allowed some exploratory dialogue, this should have balanced with a move towards a shared understanding and commitment to a way forward.
Agitator	Some team members did adopt the role of a devil's advocate; however, the team leader showed little acceptance of an agitator style as it was seen as an impediment to progress.	While the developer did adopt the role of devil's advocate, the team leader should have supported and placed more value on the benefits of this.

Table 19: Aspects of Leadership Intelligence

8.7. Conclusion and Implications

In this paper, we sought to uncover how the interplay between macro- and micro-level factors impacts cohesion and conflict in the leadership of distributed ISD teams. We presented empirical findings from the case study of the CDSS project in order to derive insights into the leadership challenges emerging from the paradox of cohesion and conflict. From a theoretical perspective, this paper contributes a novel framework for describing and explaining ISD project team interactions within a distributed setting. The framework theorizes how the interplay between macro- (e.g. structure, identity, culture) and micro-level (e.g. vision, approach, means) factors impact team cohesion and conflict. This framework provides new theoretical perspectives on cohesion and conflict in distributed ISD.

From a practical perspective, the paper provides examples of the paradox of cohesion and conflict in action. While at face value, ISD projects may seem relatively straightforward, 'wickedness' (cf. McCarthy, O'Raghallaigh, Fitzgerald, & Adam, 2018a) in the form of interpersonal differences between team members can create numerous challenges. For instance, the findings point towards the benefits of de-facto hierarchies for building cohesion around a vision but equally point to the challenges this creates in resolving conflict (*Structure – Vision*). Delineations between professional identities within a distributed team can also stimulate cohesion by clarifying domain expertise but may breed conflict where only some members have the means to enact change (*Identity – Means*). The value placed on a flexible approach can create opportunities for conflict but may eventually impede cohesion if there is limited levels of coordination (*Culture – Approach*).

Based on our findings, we set out three propositions for researchers and practitioners. We firstly suggest that distributed teams may require a new type of team leader, one with a 'paradox mindset' (cf. Miron-Spektor, Ingram, Keller, Smith, & Lewis, 2018) who understands how to shape macro- and micro-level factors so as to balance cohesion and conflict. We also put forward the concept of 'leadership intelligence' which sets out five different styles of leadership (i.e. coordinator, monitor, facilitator, mentor, agitator) for balancing cohesion and conflict.

One limitation of the case study is that the findings may not necessarily be generalizable to other contexts. Future research could also examine the emergence of cohesion and conflict in distributed ISD teams that do not have a formal leadership role and the impact this has for the interplay of macro- and micro-level factors.

Postface to Chapter

This chapter analysed how the position of leadership affected team interactions in the CDSS project, with a particular focus on the tension between cohesion and conflict in team interactions. The evolving theoretical framework was used to analyse empirical findings from this distributed ISD project. In addition, Quinn's (1988) model is used to provide insights into the styles of team leadership that were adopted in the CDSS project and how these relate to the macro and micro-level factors of the theoretical framework. Based on this discussion, three propositions are put forward:

> **Proposition 1:** *The absence of a 'paradox mindset' can lead to destructive cohesion and / or conflict in complex distributed ISD projects.*
>
> **Proposition 2:** *An 'agitator' style can promote constructive conflict in distributed ISD projects, but can lead to destructive conflict if left uncontrolled.*
>
> **Proposition 3:** *Leadership intelligence is essential for simultaneously balancing the paradox of cohesion and conflict in complex distributed ISD projects.*

These three propositions are investigated in more detail in the next chapter. Chapter 9 also aims to investigate the relationship between team interactions and ISD project team performance by looking at how teams leverage (or fall prey to) the macro- and micro-level factors which affect team interactions.

Part III: Conclusion and Implications

Chapter 10: Concluding Remarks

Competing bodies of existing literature suggest that both cohesion and conflict are necessary for ensuring high levels of team performance in distributed ISD projects. For instance, while some literature suggests that cohesion is essential to bridge misalignments between distributed ISD team members' diverse positions, interests and values, a competing body of literature suggests that conflict is equally essential to air differences of opinion and promote creativity through a diversity of ideas (Garrison, Wakefield, Xu, & Kim, 2010; Jehn, 1995; Powell, Piccoli, & Ives, 2004). However, existing literature has yet to grapple with the factors which shape team interactions in distributed ISD projects. In addition, there is limited guidance around how teams can leverage these factors to actively shape team interactions in terms of cohesion and conflict.

This presents a sizable challenge for distributed ISD project team leaders as they must embrace the seeming paradoxical tension between both conflict and cohesion in team interactions. In addition, Zhang, Waldman, Han, and Li (2015) has called for new perspectives on leadership that move beyond the assumptions of routine environments, and consider how organizational paradoxes intensify in complex and chaotic environments due to continuously changing demands in the task environment. This suggests that distributed ISD projects characterised by complexity and 'wickedness' are more likely to require a portfolio of different leadership styles in order to respond to the tension between cohesion and conflict. The ability of a team leader to deal with such paradoxical tensions is crucial (Bass, 1981; Denison, Hooijberg, & Quinn, 1995). However, contradictions such as these are often overlooked during the theory building processes in order to promote parsimony and consistency (cf. Bass, 1981; Lavine, 2014; Poole & Van de Ven, 1989); nevertheless, it has been argued that the production of actionable and relevant insights for practitioners is only possible when the reality of organizational tensions are fully recognised and addressed (Bolden, Witzel, & Linacre, 2016; Lewis, 2000).

This chapter provides an outline of key contributions and implications emanating from the dissertation based on the preceding chapters. The final chapter of the dissertation begins by revisiting the research questions in order to outline conclusions which have emerged from the three in-depth case studies: the CHP project, Athena project, and CDSS project. Theoretical, methodological, and practical contributions from the dissertation are then presented as relevant to both academic and practitioner communities. In addition, the chapter provides an overview of how insights developed from the dissertation can be used to support practitioners and team leaders engaged in undertaking distributed ISD projects going forward. The chapter is brought to a close by describing limitations associated with the dissertation, as well as opportunities for future research.

10.1. Revisiting the Research Questions

This section discusses conclusions arising from the research questions addressed in this dissertation (RQ1-4). In particular, the conclusions highlight key findings related to the within-case analysis of the three in-depth case studies (CHP project, Athena Project, and CDSS project) presented in chapters 5-8, as well as findings from the cross-case analysis presented in chapter 9.

10.1.1. Conclusions from RQ1

RQ1: What factors affect team interactions in distributed ISD projects?

Chapter 5 answers this research question through theory building from case study research. In particular, chapters 5 provides the groundwork for the theoretical framework developed in this dissertation by analysing preliminary findings from the CHP project case study. Following the structured-case approach (Carroll & Swatman, 2000), chapter 5 seeks to empirically investigate the initial conceptual model developed by the researcher. The first iteration of the theoretical framework centres on a mutual investigation of the macro-level and micro-level factors which affect interactions between humans and objects in organizational ICT practices. This aims to overcome the limitations of a strict 'dualist perspective' which investigates macro- or micro-level factors in isolation.

Chapter 5 begins by drawing on key concepts from the field of sociology, in particular the seminal works of Parsons (1951) and Bourdieu (1977), in order to offer complementary insights into the interactions between humans and objects in practice. Parsons' (1951) General Theory of Action Systems is drawn on in order to gain insights into the different macro-level factors which can affect interactions while, Bourdieu's (1977) Theory of Practice is drawn on to understand the micro-level factors which affect interactions. Preliminary findings from the CHP project provide empirical evidence of the interplay between macro-level, micro-level factors and interactions. For instance, case study findings on the interplay between identity (personality system) and approach (habitus) show how clinicians prioritised patient interactions over technology development as the most important action point in the project whereas the technicians saw requirements gathering and the agile development process as the primary course of action.

The cross-case analysis presented in chapter 9 provides further insights into this research question. In particular, we find that the impact of macro-level and micro-level factors vary depending on the level of 'openness' present; openness in the context of social groups (i.e. teams) can be defined as the lack of restriction around who can participate in decision making (Nielsen & Sahay, 2019; Oxford Dictionary, 2017; Riehle, Ellenberger, Menahem, Mikhailovski, Natchetoi et al., 2009). An 'open' process empowers all team members to engage in exploratory discussion around the vision, approach and means; while in contrast, a more 'closed' process would only grant certain team members this power. In the CHP project, team members were allowed to co-create the vision, approach, and means and as a result, differences in structure, identity, and culture were embraced during team interactions. Consequently, a high level of team interaction was sustained early on in the CHP project and team members were reengaged later when the level of team interaction tapered off. Meanwhile, in the Athena project, the industry subgroup fixed the vision, approach, and means and this masked differences in structure, identity, and culture. This gradually resulted in a low level of team interactions as the Fintech subgroup became increasingly despondent around their lack of input into the vision, approach, and means. In the CDSS project, team members had the flexibility to adapt the vision, approach, and means of the project and differences in structure, identity, and culture were allowed to propagate. The high level of team interaction generated early on however was not sustainable as team members became increasingly concerned by unresolved uncertainties in the CDSS project.

10.1.2. Conclusions from RQ2

RQ2. How do these factors interplay with team interactions in distributed ISD projects to affect shared understanding and shared commitment?

In order to answer this research question, chapter 6 presents in-depth findings from the CHP project case study in order to offer insights into how the macro-level and micro-level factors can affect shared understanding and shared commitment in distributed ISD project teams. Shared understanding and shared commitment in the CHP project was found to be shaped by the continuous interplay between structure, identity, and culture (macro-level) and vision, approach, means (micro-level). These findings highlight how wickedness in the form of deep-seated social and task-based differences can constrain shared understanding and shared commitment among a distributed ISD project team. For instance, contention between the interests of the university research centre and the multi-national IT company, as well as the SME's reluctance to commit to the project plan, impacted the teams' ability to reach a shared understanding of and a shared commitment to an approach. In addition, findings presented from the CHP project suggest that macro- and micro-level factors may shape shared understanding and shared commitment in ways which are often unexpected. Contrary to existing literature, while team members in the CHP project were able to maintain a shared understanding, this did not necessarily translate as a precursor to shared commitment. For instance, despite the considerable efforts made by the project manager to generate shared understanding among the clinicians and SME partner, shared commitment remained elusive as uncertainty remained around the dedication of resources.

The cross-case analysis provides additional insights which help explain the chasm between shared understanding and shared commitment. We differentiate between two forms of cohesion: ‘deep’ and ‘shallow’. Deep cohesion is where team members possess both a shared understanding and shared commitment to the project, whereas ‘shallow’ cohesion is where team members possess a shared understanding but a shared commitment is lacking. In the latter case, there is a chasm between shared understanding and shared commitment that must be crossed. Drawing on findings from the cross-case analysis, we suggest that cohesion is more likely to be ‘deep’ when differences in structure, identity, and culture are recognised, and the vision, approach, and means emerge during team interactions. In contrast, cohesion is more likely to be shallow when it masks differences in structure, identity and culture by imposing a fixed vision, approach, and means.

In the CHP project, the project manager was able to build a shared understanding around the project vision early on by facilitating discussions around misalignments between the professional identities of team members. However, fostering a shared commitment to an approach still proved difficult among the SME partner and clinicians, and therefore deep cohesion was not reached. Meanwhile, in the Athena project, the industry subgroup ignored differences in structure, identity, culture in order to maximise the benefits that would be derived by the insurance company. Deep cohesion again did not materialise as the fixed vision, approach and means clashed with the Fintech subgroup’s professional identity as researchers, leading to low levels of shared commitment. In the CDSS project, both shared understanding and shared commitment failed to emerged due to rifts between the professional identities of team members. For instance, shared understanding was impeded whenever the clinician subgroup dismissed the developer’s contributions to discussions around the ICU ward. Shared commitment was also impeded as the clinical subgroup failed to acknowledge the developer's calls for the assignment of deadlines and task responsibilities.

10.1.3. Conclusions from RQ3

RQ3. What is the relationship between cohesion, conflict, and team performance?

Chapter 7 provides an answer to this research question by presenting findings from the Athena project case study, and extends the theoretical framework to consider how macro- and micro-level factors impact cohesion and conflict in distributed ISD project team interactions. Findings from the Athena project caution against excessive levels of cohesion for team performance in distributed ISD projects, and suggests that moderate levels of task-based conflict are essential for discussing the differences between team members' diverse structures, identities, and cultures. It also questions assumptions embedded in the 'planning school of management' (Mintzberg, Ahlstrand, & Lampel, 1998) which typically give precedence to top-down structures, collective identities, and integrated team cultures in order to promote cohesion and mitigate any form of conflict. Existing literature often focuses on the need for distributed ISD team leaders to undertake cohesion-oriented leadership responses (Kayworth & Leidner, 2002); chapter 7 questions this assumption by asserting that both cohesion and conflict are necessary to address inherent 'wickedness' or complexity in distributed ISD projects.

Chapter 8 further suggests that excessive levels of conflict can equally impede team performance in distributed ISD project teams due unfocused discussions that diverge from the meeting agenda. In particular, findings from the CDSS project point towards the challenges that can arise when the level of task and social cohesion is low and differences around team members' structures, identities, and cultures are allowed to propagate. For instance, the absence of a decision-making hierarchy in the CDSS project allowed team members to openly engage in conflict and clarify ambiguities around the vision; however, uncertainty around team roles also inhibited cohesion in the distributed ISD project as team members were unsure who had the final call on decisions.

The cross-case analysis further examines the relationship between cohesion, conflict, and team performance using the balanced IS scorecard as a lens. Findings suggest that the co-creation strategy adopted in the CHP project was positive for realising the organizational value and stakeholder value perspectives of team performance. The participatory workshops in particular helped air differences of opinion in the distributed ISD project team early on. However, on the flip side, this created difficulties in realising the iron triangle perspective of team performance as the ability to coerce distributed ISD project team members to deliver outcomes became challenging due to the bottom-up team structure. Meanwhile, in the Athena project, the industry subgroup's strategy to fix the vision, approach and means was successful for realising the iron triangle perspective and enabled the delivery of outcomes ahead of schedule and under budget. Nevertheless, the strategy limited the level of organizational value, stakeholder value, and future readiness as it masked differences between the structures, identities, and cultures of the Fintech subgroup. Lastly, in the CDSS project, the team leader's strategy to allow differences in structures, identities, and cultures to propagate was positive for the future readiness perspective of team performance as it allowed team members to learn and question assumptions. However, the strategy impeded the team's ability to realise the iron triangle, organizational value, and stakeholder value perspectives of team performance as growing uncertainties around the project approach and assignment of resources meant that the planned budget and schedule would be missed.

10.1.4. Conclusions from RQ4

RQ4. What is the role of distributed ISD project team leadership in leveraging cohesion and conflict?

Chapter 9 further suggest that macro-level and micro-level factors can be utilised by team leaders as 'levers' for cohesion and conflict in distributed

ISD project team interactions. Findings from the cross-case analysis suggest that structure, identity, culture (macro-level) and vision, approach, means (micro-level) can be leveraged in different ways to promote cohesion and conflict. For instance, depending on the situation, team leaders might promote conflict by allowing for a bottom-up structure, individualised interests, and diverse cultural meanings or alternatively they could promote cohesion by creating a top-down structure, collective identity, and integrated team culture. Existing literature often discusses team leadership without consideration of both the contextual (macro) and localised (micro) settings in which it is embedded (cf. Pettigrew, 1987). However, findings from our cross-case analysis suggest that team leaders must rethink their relationship between macro- and micro-level factors, moving beyond an assumption that they are static attributes of the environment to see them as social phenomena which can be shaped and altered overtime.

Chapter 8 and 9 extend Quinn's (1988) Competing Values Framework by putting forward an additional style of team leadership which we call 'agitation'. This additional style focuses on embedding constructive conflict into team interactions in order to challenge the distributed team's existing structural positions, identity-related interests, and cultural assumptions. Agitation also encourages members of the distributed ISD project team to engage in constructive conflict around the vision, approach, and means of the project and work towards a new collective understanding through ongoing dialogue. Furthermore, the cross-case analysis suggests that 'agitation' can also be used to unearth different narratives around ISD project team performance (cf. McAvoy, Nagle, & Sammon, 2012). An agitation style of leadership can challenge team members to verbalise what team performance means to them based on their underlying structural positions, identity-related interests, and cultural assumptions. This is especially important in distributed ISD projects characterised by wickedness given the diversity of perspectives that are likely to be present in the team.

Based on the cross-case analysis, 'leadership intelligence' is put forward to explain how macro- and micro-level factors can best be utilised for cohesion and conflict. Leadership intelligence refers to the ability of a team leader to actively read a situation and gauge when to enact, or indeed when not to enact, a certain style of leadership. Leadership intelligence demands that team leaders alternate between open styles (facilitator and mentor) and closed styles (coordinator and monitor) of leadership in order to shape macro- and micro-level factors in a way that balances both cohesion and conflict. This finding emerged from the insight that both open and closed leadership styles are needed to balance the tension between cohesion and conflict. As evident from Chapter 7 and 8, employing one style of leadership is unlikely to be effective for balancing cohesion and conflict in environments characterised by wickedness. In the absence of leadership intelligence, individuals and groups may instead engage in inappropriate responses to circumstances which fail to capitalise on the need for both cohesion and conflict.

10.2. Final Versions of the Theoretical Artefacts

This section presents the final version of two key theoretical artefacts developed in the dissertation: (i) the typology for organizational ISD practice, and (ii) the typology of team leadership. Further explanations are provided in this section on how these two theoretical artefacts can be used by researchers and practitioners going forward.

10.2.1. The Typology for Organizational ISD Practice

The final version of the typology for organizational ISD practice is presented in Table 23. Amendments to the previous iteration of the theoretical framework were made based on accumulated insights gathered from the three in-depth case studies, as well as findings from the cross-case analysis. In particular, the cells of the framework have been edited to elucidate insights that can be derived from the application of the theoretical framework. The proceeding paragraphs also provide guidance on how the final version of the framework can be used by researchers and practitioners (i.e. team leaders).

	Structure	*Identity*	*Culture*
Vision	**Team leaders should be aware of the impact that hierarchies and team member roles can have on interactions around the vision.** While top-down hierarchies can impose a vision on team members, this only generates shallow cohesion. Differences must be negotiated through conflict to generate deep cohesion. Bottom-up hierarchies can create ongoing conflict around the vision by allowing flexibility around team members' roles.	**Team members' identities can lead to different interests in the project and affect team interactions around the vision**. For instance, identities can lead to differences between team members' criteria for project success, and their inherent motivation for engaging in the project. Conflict is needed to highlight differences in interests; however, the team leader must eventually resolve conflict around the interests to ensure team cohesion around the vision.	Clashing assumptions around the vision of a project must be addressed through focused periods of conflict between team members. **A team leader's openness to embracing differences in shared meanings around the vision is necessary to support deep cohesion**; for instance, participatory design workshops can be used to discuss assumptions and meanings. However, team members must be willing to negotiate these differences, else team interactions are inhibited.
Approach	**The structural positions of subgroup members can affect team interactions around the approach.** For instance, loose team structures can create backchannels in communication and fosters shallow cohesion as team members not included in these communications can feel excluded. Conflict is needed to ensure that team members with seemingly overlapping roles (i.e. two project managers) can clarify their position in the approach.	Contention between partners' interests in the project plan can impact team interactions around the approach. **Conflict is necessary for subgroups to express different perspectives around the approach to project management.** However, the identity of IS professionals should not solely be that of a 'middle man' between different subgroups, and responsibility for systems development should be delegated to all team members.	Partners and subgroups may have different values around how to approach project work. For instance, differences can emerge around need for formal project planning vs. a laissez faire approach that responds to change. **Team leadership should value flexibility to enable conflict around differences in values but they must also be aware of the need to eventually close down discussions.** The absence of a regimented approach can inhibit deep cohesion.
Means	Shared ownership of the project is essential, as delegating one subgroup with the power of the veto project deliverables can impede team interactions around the means. Team leaders should also be aware of how changes to the structure of a team can create uncertainty around the means of the project, inhibiting deep cohesion. **Conflict is needed to resolve uncertainties around the structure and ensure that the means of team members are effectively utilized during the duration of a project**.	Team members must have the means to challenge their identity in the project through conflict in order to clarify differences in interests. **Designating responsibility for systems development to one subgroup may mean that other subgroups ignore issues around the dedication of resources**, thus inhibiting deep cohesion. In addition, conflict between team members' professional and project-level identities can also result in 'nomadic' team members, which in turn create uncertainties around the means.	Subgroups' engagement with project deliverables may be limited by the perceived value they place on these artefacts. **Partners should discuss assumptions around what the project aims to achieve and the means available to the project team.** The team leader's ability to foster conflict around individuals' diverse meanings can help generate creative solutions. However, gaps in each team members' knowledge can still inhibit cohesion.

Table 23. Typology for Organizational ISD Practice (Final Version)

The typology for organizational ISD practice can be used by practitioners and researchers as a tool for describing and explaining the factors which shape team interactions in distributed ISD projects. In addition, the theoretical framework can help researchers and practitioners detect challenges affecting cohesion and conflict during the conduct of a distributed ISD project. For instance, the theoretical framework could potentially help team leaders to recognise areas of misalignment between subgroups in a project team. Applying the framework before, during and after a project could assist practitioners and researchers in taking action to anticipate, mitigate, and reflect on tensions between subgroups and thus improve team performance.

The typology of organizational ISD practice provides a nuanced view of team interactions in distributed ISD project teams by suggesting that cohesion and conflict may simultaneously co-exist across *different levels of the project* and may vary across *each of these levels*. For instance, cohesion and conflict overlap across the levels of project vision, approach, and means based on the continuous interplay with macro-level factors (structure, identity, and culture). While cohesion may have been reached around the vision of the project, conflict can still simultaneously co-exist at the level of a project approach. This nuanced view of cohesion and conflict goes beyond the more high-level descriptions of paradoxical phenomena in existing literature and provides additional insights for researchers and practitioners.

Team members must recognise the simultaneous need for (i) *conflict* to clarify differences in structure, identity, and culture, and (ii) *cohesion* in order to ensure alignment around project tasks. Team leaders must take team members on a journey that moves between constructive conflict and cohesion across the vision, approach and means of a project. This starts by recognising differences in structures, identities, and culture; while, team members may not necessarily share the exact same views and perceptions upfront, the team leader can help them recognise social and task level differences with a view to building a shared understanding and shared commitment going forward.

Team members need to navigate the tension between cohesion and conflict across different levels of the project. Failure to do so can mean that team members are unable to reconcile the need for cohesion and conflict across different levels of the project. For instance, early on in the CDSS project, some team members had assumed that cohesion had been reached around the vision when the clinical lead asserted his interests in the CDSS project and how this would shape the project scope. However, it turned out this this assertion was premature, and cohesion around the vision began to unravel when conflict emerged in relation to the approach. Questions around the approach reopened discussions around the vision as previous discussions had not been closed down. For instance, in the absence of the clinical lead during discussions around the project approach, the ICU dietician began to challenge previous decisions and redefined the vision. Team leaders need to be cognisant of the tensions between cohesion and conflict around the vision, approach and means of the project and tackle misalignments as they start to emerge across ongoing conversations between team members.

10.2.2. The Typology of Team Leadership

Table 24 presents the final version of the typology of team leadership. The final version of the typology draws on the existing work of Quinn (1988) and findings from the cross-case analysis to provide insights into the different styles which team leaders must be aware of to effectively lead distributed ISD project teams. In particular, the final version of the typology expands on Quinn's (1988) work by putting forward the 'agitator style of leadership', and 'leadership intelligence' as novel contributions to the framework. The proceeding paragraphs provide additional guidance for researchers and practitioners on how these different team leadership styles occur in practice.

	Description
Coordinator	Maintains stability by setting rules and standards, and outlining constraints. A coordinator style can aims to *control* the team's assigned work by creating a top-down structure with clearly defined roles.
Monitor	Creates stability by measuring progress, and distributing this data. A monitor style aims to *oversee* the work that the team must accomplish. A monitor can undertake a formal approach to project planning, with assigned tasks and deadlines.
Facilitator	Fosters flexibility by seeking consensus around divergent opinions. A facilitator aims to actively listen to, and *negotiate* team differences. A facilitator can utilize participatory design workshops to allow team members a chance to express their different perspectives.
Mentor	Promotes flexibility by supporting the personal development of individuals. A mentor style aims to create *awareness* of team members' needs. A mentor should foster an openness toward exploratory dialogue and learning.
Agitator	Solely focused on constructively embedding conflict into team member interactions to *challenge* structural positions, identity-related interests, and cultural assumptions. An agitator aims to encourage team members to express divergent opinions around the vision, approach, and means of the project and overcome siloed thinking within subgroups.
Leadership Intelligence	Refers to the ability of a team leader to actively read a situation and gauge when to *enact, or indeed when not to enact*, a certain style of leadership. In the absence of leadership intelligence, individuals and groups may instead engage in inappropriate responses to circumstances.

Table 24: Typology of Team Leadership

Insights from the cross-case analysis suggest that team leaders should enact different leadership styles at different points in time in order to promote cohesion and conflict across different levels of a project. Findings also illustrate how structure, identity, and culture can be used as levers for cohesion and conflict. For example, during the series of participatory design workshops in the CHP project, the project manager first enacted *open leadership styles* (i.e. facilitator and agitator style) to clarify areas of disagreement between stakeholders' interests through constructive conflict. This was achieved by fostering a loose structure during the workshops which allowed any team member to contribute regardless of their position in the team hierarchy. The part-time developer was highly vocal during the workshops despite being in the early stage of his career and was offered equal airtime during meetings as those in senior positions such as the PI and clinical lead. Similarly, the project manager allowed team members to clarify their individual interests and diverse cultural meanings around the project regardless of whether they contradicted the sentiments put forward by others. The workshops provided a forum for the IS subgroup and clinical subgroup to clarify their interests around the development of the connected health platform and put forward their views on how the IT artefact would complement current healthcare services. This open leadership style in turn allowed team members the freedom to make decisions around the vision, approach, and means.

However, the team leader in the CHP project also enacted *closed leadership styles* (i.e. monitor) later with the aim of utilising macro- and micro-level factors as levers for cohesion. Following the participatory design workshops, the team leader undertook project planning in order to progress work and ensure that the conflict around the approach was constructive resolved through high-level descriptions of work. The team leader utilised structure for cohesion both at the level of the project approach and means; however, the effectiveness of structure to balance cohesion and conflict varied across the two levels. For instance, the SME partner created upheaval when they realised that they had to commit resources towards the defined tasks. This points to the leadership challenges in navigating cohesion and conflict across different levels of a distributed ISD project: a strategy that works well at one level may be less effective at another level depending on the situation.

Findings also point to the contingent relationship between leadership and ISD project success. In particular, findings from the cross-case analysis suggest that the adoption of a leadership styles may be contingent on how ISD team performance is defined. The enactment of both open (i.e. facilitator, mentor, and agitator) and closed leadership styles (i.e. coordinator, monitor) will only be needed if a holistic view of team performance is adopted, one which considers the iron triangle, organizational value, stakeholder value, and future readiness. However, depending on the circumstance, leaders can also decide to minimise complexity by ignoring certain perspectives of team performance and choosing only one or two leadership styles to enact. For instance, a single style of leadership such as coordinator may be appropriate where team performance is solely defined in terms of the iron triangle. If the only concern is delivering a project on time, within budget and scope, then a team leader may choose to pay less attention to open leadership styles aimed at fostering conflict and flexibility (i.e. facilitator, mentor, and agitator). However, this decision may result in a short-term and myopic view of team performance, one which fails to consider the long term impact of a project in terms of stakeholder value, organizational value, and future readiness. In order to realise all four perspectives of team performance, team leaders must alternate between open and closed leadership styles over time.

The typology of team leadership can be used by practitioners and researchers as a tool for describing and explaining how team leaders influence team interactions in distributed ISD projects. Team leaders can enact different leadership styles to move between periods of cohesion and conflict, utilising macro- and micro-level factors as ‘levers’ for team interactions. In addition, the theoretical framework can help researchers and practitioners anticipate some of the challenges faced in enacting the variegated styles needed to generate both shared understanding and shared commitment among distributed ISD teams. The theoretical framework could help team leaders to identify styles which they are comfortable in enacting, and those that they would prefer to delegate to others. For instance, in the CHP project, the project managers enacted a monitor and facilitator style of leadership, and also allowed the developer to adopt an ‘agitator’ style of leadership. As previously discussed, the choice of leadership style may also be impacted by how team performance is defined. The typology of team leadership can allow a team leader to understand what styles will be required to deliver different perspectives of success. Applying the framework before, during and after a project could assist practitioners and researchers grappling with team leadership in distributed ISD projects, providing valuable insights into the various styles needed to derive a holistic perspective of team performance.

10.3. Contributions and Implications

This subsection outlines contributions from the dissertation. The contributions are grouped into three categories: theoretical, methodological, and practical contributions.

10.3.1. Theoretical Contributions

The primary contribution of this dissertation is the development of a novel theoretical framework for describing and explaining how the interplay between macro- and micro-level factors shape team interactions in distributed ISD projects. The theoretical framework draws on complementary insights from the works of Parsons (1951) and Bourdieu (1977) as well as new empirical insights from the in-depth case studies of the CHP project, Athena project, and CDSS project. This represents a unique and original contribution to existing literature. To the best of our knowledge no comparative theoretical frameworks are in existence. The empirical findings and theoretical framework presented in this dissertation can help deepen scholars' understanding of the complex and dynamic nature of team interactions in distributed ISD projects. In addition, the theoretical framework also has implications for the management of cohesion and conflict in distributed ISD projects by providing insights into the interplay between macro-level factors, micro-level factors and team interactions.

Secondly, the dissertation provides empirical insights into how shared understanding and shared commitment among the team can be affected by differences in structures, identities, and cultures around the vision, approach, and means. In addition, findings from the CHP project case study suggests that, contrary to existing literature, shared understanding is not necessarily a precursor to shared commitment in distributed ISD projects. In particular, shared commitment to the vision, approach, and means may not arise, even where shared understanding is relatively well established. Nevertheless, the findings also suggest that periods characterised by a lack of shared understanding can be constructive. These periods allow team members to contribute divergent opinions and challenge existing assumptions. As a result, team members are prevented from becoming prematurely attached to preconceived viewpoints. Theoretical insights are also provided into initiatives that can help promote shared understanding and share commitment in distributed ISD projects, such as Joint Application Development (JAD) workshops, patient journey maps, prototyping and storytelling. This constitutes an important area of future research, as outlined in the final subsection of this chapter.

Thirdly, the dissertation makes a novel theoretical contribution to literature by considering the relationship between cohesion, conflict and team performance. The dissertation provides novel insights into distributed ISD project team performance as existing literature has not yet examined this relationship. In order to structure these discussions, the dissertation draws on the different perspectives of team performance outlined in the Balanced IS Scorecard (cf. Martinsons, Davison, & Tse, 1999) and the related work of Atkinson (1999). Project team performance is examined using both objective (i.e. iron triangle) and subjective (i.e. organizational value, stakeholder value, future readiness) measures. Subjective measures are based on the responses of interviewees and participant observations by the researcher. In particular, the dissertation provides theoretical insights into how cohesion and conflict relate to the iron triangle, organizational value, stakeholder value, and future readiness perspectives of distributed ISD project team performance.

Lastly, the dissertation contributes theoretical insights into the role of team leadership in leveraging cohesion and conflict. The theoretical contribution centres on how team leaders can respond to and utilise macro- and micro-level factors in distributed ISD projects. The dissertation puts forward an additional style of team leadership called ‘agitation’. This theoretical contribution expands on the four aforementioned team leadership styles of Quinn’s (1988) Competing Values Framework, by considering how team leaders embed constructive conflict into team member interactions in order to challenge structural positions, identity-related interests, and cultural assumptions. In addition, the dissertation puts forward the concept of ‘leadership intelligence’ to contribute theoretical insights into how leaders can develop the sensitivity to know when to promote and suppress different leadership styles over the course of a project, and indeed even during an individual interaction. For instance, findings from the CHP project suggest how leadership intelligence can enable a team leader to continuously examine the interplay between macro- and micro-level factors in order to promote both cohesion and conflict.

10.3.2. Methodological Contributions

A number of methodological contributions were made by this dissertation (see Chapter 4). Firstly, the dissertation demonstrates how in-depth case study methods are appropriate for investigating the research objective and research questions. Participant observations, document analysis, and interviews are used by the researcher to describe and explain how different macro- and micro-level factors shape, and are shaped by, team interactions in distributed ISD projects characterised by wickedness. These methods are useful for investigating the social aspects of distributed ISD projects as they allow the researcher to collect ‘thick’ descriptions of the context under investigation based on the first hand observations of, and responses from, participants. In particular, these methods enable the researcher to understand the complex structures, identities, cultures (macro-level), visions, approaches, and means (micro-level) which emerged during interactions between members of the distributed ISD project team. This is achieved using a theoretical lens to filter data and arrive at a deeper understanding.

Secondly, a qualitative method is shown as appropriate for gaining insights into how team members subjectively perceive the interplay between macro- and micro-level factors as well as cohesion and conflict. The dissertation presents a comprehensive analysis of qualitative data from semi-structured interviews, participatory observations, and project documents across three in-depth case studies. The triangulation of findings from these qualitative data sources provide unique insights into participants' differing perceptions of team interactions, as well as the macro- and micro-level factors which affected cohesion and conflict. The adoption of a qualitative method in this dissertation also enables the researcher to gain a rich understanding of the research context and how participants view inherent aspects of wickedness in distributed ISD projects, something that would be difficult to capture using quantitative data collection techniques alone (Ritchie, Lewis, Nicholls, & Ormston, 2013).

Thirdly, the dissertation demonstrates how a multiple case study research design can be used in the context of the research objective and research questions to build theory around how macro- and micro-level factors shape, and are shaped by, team interactions in distributed ISD projects. For instance, the cross-case analysis provides insights into the differences and similarities between the three in-depth case studies, and allows for potential frame-breaking of the theoretical framework (Eisenhardt, 1989). The dissertation also points to the appropriateness of the structured case approach (cf. Carroll & Swatman, 2000) for theory building in case study research. The dissertation demonstrates how the structured case approach can guide an iterative approach to theory building through multiple case study research using an evolving conceptual model (see Chapter 4) which the researcher then refines based on empirical insights (Chapter 5-9). This unique contribution uncovers how empirical and theoretical insights co-evolve and inform one another over time, based on the researcher's evolving understanding. For instance, the dissertation showcases how the structured case approach enabled the researcher to develop a new theoretical framework based on a within- and cross-case analysis of empirical data from multiple in-depth case studies, as well as logical propositions from existing literature. This goes some way towards addressing the enduring questions of how theory is constructed in information systems, and what research methods can be used to support their construction (Gregor, 2006).

10.3.3. Practical Contributions

The dissertation also makes a number of important practical contributions. Firstly, Chapters 6, 7, and 8 provides practitioners (i.e. team leaders, programmers, analysts) with empirical insights into how underlying macro- and micro-level factors shape interactions in distributed ISD projects (RQ1). An understanding of the continuous interplay between structure, identity, culture (macro-level), vision, approach, and means (micro-level) can also help practitioners better understand the factors which are likely to affect team interactions over time.

Furthermore, the theoretical framework can provide team leaders with a tool for examining shared understanding and shared commitment among members of the distributed ISD team (RQ2). The interplay between each of the six factors covered in the theoretical framework has numerous implications for the leadership of distributed ISD teams, as evident from the cross-case analysis. For instance, the theoretical framework can help reveal differences in team members' contextual backgrounds and allow the team leader to anticipate the challenges of shared understanding and shared commitment that are likely to occur during the conduct of a distributed ISD project. Consequently, instead of avoiding hard discussion due to trepidations around the wickedness or complexity faced, practitioners can 'go in with their eyes open' and take proactive measures to address potential risks as they emerge. Consequently, the theoretical framework can guide practitioners' thinking during team interactions and support optimal responses to foster both shared understanding and shared commitment.

In addition, the dissertation provides practical insights into the relationship between cohesion, conflict, and team performance (RQ3). For instance, chapter 7 and chapter 8 suggests that cohesion and conflict are both needed to maximise team performance in distributed ISD projects. This can help practitioners improve distributed ISD project team performance through the enactment of both cohesion and conflict-oriented responses. The dissertation also contributes propositions for practitioners to consider for distributed ISD project team leadership. In particular, the propositions suggest that cohesion and conflict are appropriate for realising different perspectives of ISD project team performance, as per the balanced IS scorecard. This can provide practitioners with new insights into the objective and subjective measurement of distributed ISD project team performance.

The dissertation also describes how leadership intelligence can allow team leaders to leverage structure, identity, culture, vision, approach, and means to balance cohesion and conflict in a distributed ISD project team (RQ4). The findings suggest that in environments characterised by wickedness, no single style of leadership will be effective for balancing the organizational tension between cohesion and conflict. The team leader must alternate between different leadership styles depending on the situation. For instance, the situation may require a need for conflict to clarify differences in structure, identity, and culture, or cohesion in order to ensure alignment around project tasks. Team leaders must take team members on a journey that moves between conflict and cohesion across the vision, approach and means of a project. This starts by recognising differences in structures, identities, and culture; while, team members may not necessarily share the exact same views and perceptions upfront, the team leader can help them recognise these differences with a view to building cohesion going forward.

10.4. Limitations

This subsection outlines limitations associated with the dissertation. Firstly, despite the researcher’s best efforts, there were some team interactions which he could not observe first hand. For instance, in each case study, certain meetings took place in private between senior members of the distributed ISD project team which the researcher was not privy to. The researcher was also unable to access documents and emails which were deemed confidential in each case study, such as those concerning the contractual agreement between the project partners. In addition, data collection was subject to temporal and geographical constraints as it was not possible for the researcher to be simultaneously present in multiple locations at the same time; this is an inherent limitation associated with case study research in distributed ISD project teams as team members are located across different offices in distinct geographical locations. While the researcher attended regular meetings across each of these offices, his work desk was located in one office shared with certain members of the project team. Consequently, this may have shaped the findings gathered through participant observations as the researcher had unrestricted access to the office in which his work desk was located. However, it is hoped that these limitations did not drastically alter the findings as multiple sources of data were used to triangulate findings and overcome bias inherent in each source of data.

Another limitation concerns the temporality of the case studies. While case study 1 (CHP project) and case study 3 (CDSS project) were conducted in real-time, case study 2 (Athena project) was conducted retrospectively, and concerns a distributed ISD project which took place two years prior to the dissertation. Participant recall was therefore identified as a limitation of case study 2 as the interviewees faced some difficulties when trying to accurately recall the details of events that took place in the recent past. In order to address this limitation, the researcher shared project information with interviewees in order to assist their recall of factual information i.e. related to the project timeline, the project scope. However, the researcher took steps to ensure that participants were not overly influenced by existing material, allowing their accounts to emerge naturally during the interviewing process.

The motivation of participants to recall certain pieces of information could also be limited by pre-existing functional relationships within the team. While the distributed ISD project team in each case study was disbanded after the final deadline, the functional relationship between certain participants remained. These close relationships may in turn have created a hesitancy among some team members to discuss sensitive information about an individual that they continued to work with. Participants may have been more candid when talking about team members with whom they no longer maintained a functional relationship. Similarly, the accounts provided by some participants may have been aggravated due to tarnished relationships with one or more team members. Interview findings suggest that the emergence of task and social conflict between certain team members in each project resulted in resentment, which in turn may have affected their recall of different events. However, it is again hoped that this limitation was addressed through the use of multiple data sources to triangulate findings and overcome subjective biases that may be inherent in each individual source of data.

10.5. Future Research

This subsection outlines opportunities for future research. Firstly, future studies can seek to apply the theoretical framework developed in this dissertation to other settings in order to further examine how the interplay between structure, identity, culture (macro-level), vision, approach, and means (micro-level) impacts cohesion and conflict. While the in-depth case studies in the dissertation were primarily set in the healthcare domain, steps were taken during the theory building process to ensure that the theoretical framework did not 'over determine' or over fit the phenomena of interest (cf. Siggelkow, 2007). The inquiry can therefore be categorised as an instrumental case study (cf. Stake, 1995) as the conduct of case study research seeks to provide an understanding of something other than the particular case in question. Instead the case studies are instrumental in understanding the phenomena of cohesion and conflict and their underlying relationships. For instance, the theoretical framework sought to rise above the idiosyncratic nature of each case by drawing on concepts from the field of sociology. This should enable other researchers to readily apply the theoretical framework to different research settings without the need for considerable adaptation of the concepts. In addition, future qualitative research can investigate how team interactions are shaped by the involvement of both an academic and industry partner. While the case study findings recognise the diverse organizational backgrounds of team members, it was outside the scope of the dissertation to fully consider the unique implications of academic-industry collaborations.

Future research can investigate the unique contextual and localised factors at play within such collaborations.

Future research can also investigate the propositions outlined in Chapter 8 which centre on the relationship between styles of team leadership and ISD project team performance. In addition, findings from the cross-case analysis suggest that certain styles of leadership may be more suited towards certain perspectives of project team performance (i.e. coordinator style for the iron triangle perspective of team performance). It is proposed that in environments characterised by 'wickedness' or complexity, where numerous perspectives of ISD project team performance must be considered, the leader should alternate between different styles of leadership in order to cater to contrasting definitions of ISD project team performance. While such an investigation was beyond the scope of this dissertation, future research could undertake qualitative and qualitative research to gain insights into these propositions.

Future research can also investigate how project deliverables might serve as boundary objects (cf. Carlile, 2002, 2004) for balancing cohesion and conflict during team interactions. For instance, future research can seek to document learnings on how the use of project deliverables such as the 'Integrated Patient Journey Map' fostered shared understanding and shared commitment in the CHP project (McCarthy, O'Raghallaigh, Woodworth, Lim, Kenny et al., 2016). This can in turn help guide the design of boundary objects for shared understanding and shared commitment in other practices.

Similarly, future research can aim to design effective tools for cohesion and conflict among distributed ISD project teams. Future studies could be undertaken using a design research approach that is underpinned by the kernel theory of boundary objects. In addition, such tools must be designed with utility of different team members in mind, which requires an understanding of the underlying macro- and micro-level factors that shape interactions. The theoretical framework outlined in this dissertation can support this direction of future research by offering insights into the interplay between macro-level and micro-level factors.

Future research could also build on the contributions of this dissertation to build practice-based interventions aimed at facilitating collaboration and shaping the behaviour of team members to promote both cohesion and conflict. Interventions can be defined as a process of action that involves the assignment of an approach (e.g. method, toolkit, or technique) or product (e.g. artefact, procedure) to participants for the purposes of producing an intended effect (U.S. National Institutes of Health, 2016; Zwarenstein, Goldman, & Reeves, 2009). For instance, future research could seek to create a toolkit for team leaders to help guide their decision-making processes; this toolkit could consist of the theoretical framework presented in this dissertation as a visualisation tool to map out and anticipate potential challenges during distributed ISD team interactions. Findings from the cross-case on the macro- and micro-level levers for cohesion and conflict could also be presented to guide team leaders, as well as supporting knowledge on how boundary objects can be used to focus discussions during participatory design workshops.

Future research will be undertaken by the researcher to document the lessons learned during the theory building process and investigate how the structured case approach was used to guide the development of the new theoretical framework. While Carroll and Swatman (2000) offer a useful guideline on how to conduct iterative theory building from case study research, there are still opportunities for explicating the approach. For instance, Carroll and Swatman (2000) do not provide detailed guidance on the process of theory building in a multiple case study approach and how insights arising from a cross-case analysis can shape the theory building process. As a result, the applicability of the structured case approach to multiple in-depth case studies should be investigated going forward.

Finally, the dissertation can help support future research on distributed ISD team performance by building on the empirical findings from each in-depth case study. This is an important area of future research given the increased focus on distributed ISD project collaborations in both academia and industry. The dissertation will support the creation of evidence-based policy recommendations for multi-disciplinary research funding calls in the future, which place a heightened emphasis on the challenges around distributed teams in environments characterised by wickedness. As a result, the resilience of such projects can be strengthened, thus improving the likelihood of successful project outcomes going forward.

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Appendix A: Sample Interview Protocol

Date and Time: ____

Location: ____

Interviewee (Title and Name): __________________________________

Role: ____

Organization:
____

Interviewer: ____

<u>Introductory Protocol</u>

Before starting the interview, I would like to ask your permission to record our conversations today. The voice recording will only be used by the researcher to transcribe your responses, and the recordings will not be shared with any third parties.

I have planned this interview to last between 45 and 90 minutes. During this time, I have several questions that we would like to cover. Participation in the study is voluntary and all data collected will be anonymised and remain confidential. It will be securely stored on an encrypted and password protected laptop located in a locked office on university main campus. Anonymised findings will be published in conference proceedings and research journals going forward.

1. How would you describe your role on the project?

2. How would this differ to your role in your organization?

3. Why did your organization become involved in the project?

4. What was your own vision for the project?

5. (a) How would you describe the level of complexity in the project?

   (b) What were the main sources of this complexity?

6. Did you observe any differences between the disciplines in terms of how they approached project work?

7. Were there any moments when you perceived differences between the disciplines in how they perceived the problem or solution?

8. Did you encounter any challenges when working with the different disciplines?

9. How would you describe the level of shared understanding around the project scope?

10. How would you rate the effectiveness of project deliverables for creating a shared understanding of the project scope among the team?

11. What were the three key moments of the project for you? (successes or failures)

12. (a) Which team members do you think had a strong influence in shaping the project? i.e. the vision, approach, and means.

    (b) Was the source of this influence?

13. How would you describe the roles of the multi-disciplinary team members in the project?

14. (a) How would you describe the role of the academic and commercial partners?

    (b) Were there any power relations between partners?

15. What would you say are some of the lessons learned from the project?

16. What is your vision for the project going forward?

Appendix B: Sample Data Coding Table

Name	Files	References	Created On	Created By	Modified On
Back channels in communication	7	27	26/07/2017 12:02	SMC	13/02/2018 11:53
Location of team	2	2	26/07/2017 14:04	SMC	26/07/2017 16:32
Objective uncertainty	6	21	26/07/2017 10:37	SMC	26/07/2017 16:41
Benefit of multi-disciplinary teams	2	6	26/07/2017 14:49	SMC	26/07/2017 16:38
Constrained access to feedback	6	20	13/02/2018 12:20	SMC	22/08/2018 12:09
NICU decision making	5	12	26/07/2017 09:44	SMC	26/07/2017 16:33
NICU hierarchy	5	8	26/07/2017 10:14	SMC	26/07/2017 16:47
Isolation of developer	6	21	26/07/2017 09:47	SMC	13/02/2018 12:21
Background of team	6	11	26/07/2017 09:53	SMC	26/07/2017 16:35
Relationship with software	6	12	26/07/2017 09:46	SMC	13/02/2018 11:57
Level of clinical engagement	7	27	26/07/2017 10:08	SMC	26/07/2017 16:44
Interest in project	7	22	26/07/2017 09:38	SMC	26/07/2017 16:35
Medical device certification and regulation	4	13	26/07/2017 11:30	SMC	26/07/2017 16:46
Management approach	8	19	26/07/2017 10:00	SMC	26/07/2017 16:43
Absence of project manager	5	24	26/07/2017 11:05	SMC	26/07/2017 16:12
Multi-disciplinary challenges	5	16	26/07/2017 10:34	SMC	26/07/2017 16:47
Artefacts for req gathering	4	15	26/07/2017 10:40	SMC	26/07/2017 16:43
Clinical vs. research work	8	20	26/07/2017 09:38	SMC	26/07/2017 16:42
Language differences	4	12	26/07/2017 09:43	SMC	26/07/2017 16:45
Perception of complexity	6	20	26/07/2017 09:49	SMC	26/07/2017 16:17
Role uncertainty in team	7	20	26/07/2017 09:37	SMC	26/07/2017 16:14
Disciplinary disagreements	3	11	26/07/2017 09:52	SMC	26/07/2017 14:16
Role of industry partners	6	23	26/07/2017 10:03	SMC	26/07/2017 16:08
Team power dynamics	5	20	26/07/2017 10:46	SMC	26/07/2017 16:33
Uncertainty in outcome	8	30	26/07/2017 10:14	SMC	26/07/2017 16:46
EHR dependencies	5	9	26/07/2017 10:00	SMC	26/07/2017 16:36

Structure - Approach

Reference 4 - 6.35% Coverage

My impression of the hierarchy on LB's tech side, was that AF was on top, then ROP as the project manager, and then rest of team. However, the hierarchy was less obvious and it can't be seen very much. I wasn't sure where WS fit in but felt that he had a link to CM.

AF's primary role was making decisions i.e. saying yes or no to a project, stating what is beneficial, taking on work together, and negotiating. I felt that AF needed to be involved on an ongoing daily basis to decide how things should be done. Everybody wishes for good outcome on the project and you need someone who has a good view of project as a whole. AF has experience and knowledge of the project scope.

KL is similar to AF on clinical side, and the lines between them are blurred. KL has picture of what she wants the IT side to be, which also incorporates clinical requirements.

I presume KL calls AF to communicate IT side fortnightly. KL was not always at the workshops but she seemed to know what was going on.

ROP job as the project manager was to manage and delegate jobs. The vision was defined by AF and KL, which was then communicated to ROP who managed the implementation. It's like a family chart and AF and KL have parental roles and are equal.

Reference 5 - 2.79% Coverage

I was surprised to find that others were in room. I didn't expect TG and Phil to be at the workshop as I had the impression that they wouldn't be involved and the work would only be carried out by SIB and the clinical side. I was also surprised later to find out that Priscila was involved. I felt that a lot was happening outside the clinical setting which I was unaware of. I usually only encountered TFI bosses, patients and co-workers. I felt slightly intimidated by all the IT people in the room and I wished that KL was there for backup.

Reference 6 - 1.97% Coverage

I didn't have a problem with the amount of questions asked but felt that some questions were hard to deal with as I don't know the answer and felt I had to revert to KL. I was prepared to deal with aggressive questioning from her experience with medical interviews. In addition, I

Identity - Approach

Reference 1 - 2.98% Coverage

I am an MSc student working part time on research project. MSc is main focus at this time but the project is basis of my MSc and provides empirical data. I have another job outside both the MSc and the research project. Outside that my family is important.

I'm not sure how to define yourself – hard working, attentive, try to find best way of doing things ROP: I notice you don't mention your skills as a programmer

I have a broad range of skills and I'm willing to learn but I'm not willing to sell myself as a programmer: java, JavaScript I would agree that I am a techie but I wouldn't define myself as a techie to others cause I wouldn't go on the computer after work. Techies mainly do this and it's important to spend time tinkering, but I don't as I'm always on the go.

Reference 2 - 2.10% Coverage

There were a lack of availability and interest among clinicians. I wasn't available when she (LY) was available. LY's priority is what KL asks her to do which is anything but LB, aside from clinical guidelines. The reason is it's not priority (for LY) is that it's not priority of her boss. LB is seen as a small clinical study that is meaningless as there's nothing ground breaking.

LY didn't understand when development took longer than necessary. The CHG is demo-able but there's no point is communicating it to them. We'll just give it to them.

Reference 3 - 2.03% Coverage

I'd see her role as a general gofer who will do whatever people ask even though it's not in her contract. She doesn't have patients so she would sit at a desk. She still deals with patients but not in LB, and she wasn't really viewed as on a project. LY defines herself around patients

Culture - Approach

Reference 1 - 0.80% Coverage

I'd have managed technical projects in the past and I would have also managed organisations so it would have been a continuation. I assume that was one of the reasons I was brought in for this project because I had a research background having done a PhD but also I had the technical background from my previous experience

Reference 2 - 3.42% Coverage

I'm not sure at the start there was any process there. It seemed to be a lot of loose individuals thinking that they had to do certain things. I think it transpired at some of those early meetings that there wasn't a shared understanding of what LB was all about. You've had experienced a situation where the clinician told us that she assumed that she would be doing the development work which to be honest was bizarre. So I think there was a lot of people believed a lot in the project but not many shared a common understanding of what it was about. Also I think different people were committed to different things. Obviously, if you came from a business information systems background, we'd have put a lot of value and we've have seen the difficulty in developing the platform. I'm not sure that was understood by others. It obviously wasn't if a clinician turns around and says that she thought she'd be responsible for building the platform. So I think a lot of it at the start was baby steps, trying to get people to see the bigger picture, to communicate what the bigger picture was. Especially as it was communicated in the proposal cause it also transpired that a lot of people hadn't seen the proposal. So I think a lot of it was about trying to communicate that vision, trying to share that vision and then ultimately trying to align activities behind it.

Reference 3 - 1.38% Coverage

Yeah I think very often it was getting people to work together, to come out of silos, definitely at the start in earlier meetings we either had a clinician discussion or a technological discussion. So when we were having a technological discussion, sometimes clinicians would have their arms folded cause it wasn't relevant to them and vice versa when we were having a clinician discussion, the technologist would have their arms folded. So the biggest issue was to get people to realise that it took all those elements combined to deliver the platform.

Appendix C: Sample Vignette

Vignette of a Design Meeting from the CHP Project

This section outlines a vignette from the case study of the connected health project. The case involves two subgroups (c.f. Aggarwal, 2014): ‘clinicians’ including a clinical researcher and clinical lead, and ‘technologists’ consisting of a PI, project manager, developer, and analyst. Members of the ‘clinician’ and ‘technologist’ subgroups were geographically dispersed across different locations. The vignette of a design specification meeting was selected from the case as it provides a rich account of how the macro-level factors of structure, identity, and culture impacted the micro-level interactions of the project team. It offers a fertile context for investigating the defined research question. Prior to the meeting, the project team had interacted continuously using email, teleconferencing, and a knowledge management system. For instance, the team engaged in online interactions to collaboratively define the project scope, explore different approaches, and transfer disciplinary knowledge. Scheduled face-to-face meetings were also organized, including a series of workshops to formulate the project vision, and elicit requirements for the platform. However, communication had gradually decreased over recent months of the project, and in the weeks prior to this design specification meeting, interactions between the two groups had all but ceased.

The design specification meeting was scheduled during the fourth month of the project by the project manager in order to reconnect with the clinicians and provide an update on work carried out around the development of the EHR prototype. The meeting took place on October 14th 2015 between the hours of 16.00 and 17.45. The project manager, the clinical researcher, the analyst, and a developer attended the meeting. The EHR prototype was an open source solution which had been customized for the purposes of the research study. Certain features of the EHR had been removed and others had been modified or added based on the requirements specified by clinicians during previous meetings and workshops. For instance, the developer had built a Maternity Vitals Assessment form to be used by the clinicians for recording the vital signs of participants in the research study. With deadlines looming, the project manager was keen to get sign-off from clinicians, and to finalize the design specification in line with the project plan.

The vignette is outlined below as a narrative between the team members in attendance. While the PI and clinical lead were unable to attend due to other commitments, their views still shaped the interactions among those present. The narrative has been reconstructed using the lead author's participant observation notes and project documentation.

To begin the meeting, the analyst demoed the changes that had been implemented in the EHR since the team had last met. The team sat around the analyst's computer to discuss the changes.

- **Analyst:** '*Our work on the 'Maternity Vitals Assessment' prototype form was completed based on the use case requirements. I'll just bring up the form now'.* [Analyst moves mouse on PC screen and clicks on option]

- **Developer:** '*Ok so here on the Maternity Vitals Assessment form, the mandatory fields are the 'Date' and 'Category' field. The 'Category' field is used for categorizing why the assessment has been undertaken and it has four options: 'Routine', 'Post-Op', 'Orthostatic', and 'Unstable'.'*

- **Clinical researcher:** '*The title 'Category' here doesn't make sense for the research study. Could you change the title to 'Location'?'*

- **Project manager:** '*Ok I understand. But I thought the Location would be specified when you're recording details of the participant visit rather than results of the actual assessment? I'd prefer if we could avoid making any unnecessary changes.*'

- **Clinical researcher:** '*The clinical lead would like to see it here. Also, the 'Pulse', 'Cuff size', and 'Position' fields aren't needed. Otherwise its ok.'*

These changes were not anticipated by the other team members and contradicted previous discussions on how readings of the vitals are recorded. Once the analyst's demo was concluded and any changes to the requirements were noted, the project manager moved on in the hope that team members could progress towards sign-off.

- **Project manager:** '*So are we happy with these discussed changes to the EHR? We would hope to close out requirements today as the deadline is approaching.'*
- **Clinical researcher:** *'Yes in general it's fine. The list of Symptoms you showed me are ok, but the clinical lead wants to add 'Birth interval of >10 years' and 'Maternity Age > 40' to the Risk Factors list. They would be of interest to the research study'.*
- **Project manager:** *'Ok these factors weren't mentioned before. Do you require any other items to be added to this list?'*
- **Clinical researcher:** '*No I think that's it. The additional risk factors came up during my recent conversations with the clinical lead. She hadn't discussed them with me before either.'*

It was becoming apparent that a gap in understanding had opened between the clinicians and the other team members. The clinical researcher did not seem to remember the previously agreed list of symptoms and risk factors, and the analyst had to display both lists to remind her.

- **Project manager:** '*So is there anything else that we need to change?*
- **Clinical researcher:** '*Is it possible to automatically calculate the gestational age of each participant? I think this is a priority, and should be included before any work is finalized.'*
- **Project manager:** '*We ruled this requirement out of scope at one of the recent workshops.*'
- **Clinical researcher:** '*I think the requirement needs to be ruled back in scope as it will ensure that the gestational age entered is correct. The calculation is currently done manually in the hospital but automating it in the system would help reduce the risk of error. There are smartphone apps*

that have a gestational age calculator. Can you not take this code and use it?'

- **Project manager:** '*It's not that straightforward! As I said the requirement was documented as out of scope so ruling it back in at this stage will put a lot of pressure on the project development timeline. Also we had previously discussed that values from the paper-based maternity chart should be transcribed verbatim into the EHR.'*
- **Clinical researcher:** '*It's likely that a midwife will be entering data for the research study and if there's an error with the gestational age figure, the clinical lead will ask me why it's inaccurate. This will be avoided if the calculation is automated.'*
- **Project manager:** *'We didn't know that the midwife would be involved. We'll have to extend the deadline to allow enough time to develop this new feature. This impacts on the start date of the research study.'*

The clinical researcher's request had come as a surprise to the other team members as their understanding was that the requirement to calculate the gestational age had been ruled out of scope during an earlier workshop. However, the clinical researcher expected that the team would provide flexibility to allow the list of requirements to continue to evolve overtime, and she was also surprised that her request would impact on the timeline. As a result, the atmosphere of the meeting became contentious with both sides failing to reach agreement on how to proceed. At one point the clinical researcher expressed frustration with the discussions.

- **Clinical researcher:** '*Fine, just get rid of the automated gestational age calculator. I'll calculate it manually.*'
- **Project manager:** '*Hold on, we can explore if it might be possible to reach a compromise. Are there any alternatives to the automated calculation?*'
- **Clinical researcher:** '*Well it would help if there was a field for entering the expected delivery date, but an automated calculator would be better.*'

- **Project manager:** '*But as I said the date for adding new requirements has passed. We want to close out requirements now. If this had been highlighted earlier, we could have built the feature but now we only have a few weeks before the deliverable is due.*'
- **Clinical researcher:** '*But it's important for us that an accurate gestational age figure appears for each participant record.*'

Despite the other team members' effort to communicate the difficulty they faced in implementing this requirement within the available time, the clinical researcher asserted that the requirement was essential and a compromise did not seem forthcoming. The clinical researcher then indicated that she was eager to end the meeting and return to obligations in the hospital and she moved towards the door to leave. Before leaving, the team did agree that it would be useful to organize a follow up meeting to run through the EHR's features again. However, a few days after the meeting, the clinical lead emailed the PI and the other team members to say that the requirement to develop a gestational age calculator must be ruled back in-scope. The team was then mandated by the PI to implement the requested feature. Despite their initial disappointment with the decision, the non-clinical team members proceeded to complete the task.